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IN THE UNITED STATES PATENT AND TRADEMARK OFFICE
PATENT APPLICATION TRANSMITTAL LETTER

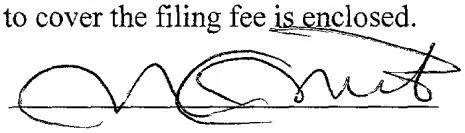
To the Commissioner of Patents and Trademarks:

Transmitted herewith for filing under 35 U.S.C. 111 and 37 C.F.R. 1.53 is the patent application of J.J. Richardson et al entitled Sensing Device For Monitoring Conditions At A Remote Location And Method Therefor claiming priority of provisional patent application serial number 60/60/113466, filed 12/23/1999.

Enclosed are:

[X] 50 pages of written description, claims and abstract.
[X] 9 sheet(s) of drawings (in triplicate).
[ ] an assignment of the invention to _____, ; please record and return; recordal fee in the amount of _____ is enclosed.
[X] executed declaration of the inventor(s), non-inventor, assignee or licensee.
[ ] a certified copy of a (foreign) application.
[ ] associate power of attorney.
[X] 4 verified statement(s) to establish small entity status under 37 C.F.R. 1.9 & 1.27.
[X] information disclosure citation - Form PTO 1449.
[ ] preliminary amendment.
[X] return receipt postcard addressed to Mark E. Wiemelt, Esq.
[X] petition requesting conversion of provisional application to non-provisional application.
[X] other: microfiche appendix – 1 page – 35 frames.
[X] a check in the amount of $1284.00 to cover the filing fee is enclosed.

Dated: 11/2/99



ADDRESS COMMUNICATION TO:

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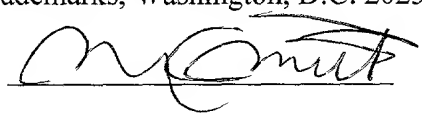

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re provisional application of: J.J. Richardson et al.
Serial No.: 60/113466 Group No.:
Filed: 12/23/98 Examiner:
For: Sensing Device For Monitoring Conditions At A Remote Location And Method Therefor

Office of the Assistant Commissioner for Patents
Crystal Park Bldg. 2, Room 919
Washington, D.C. 20231

PETITION REQUESTING CONVERSION OF PROVISIONAL APPLICATION TO NON-PROVISIONAL APPLICATION

Dear Sir:

Please convert the above-referenced provisional application to a non-provisional application.

Please substitute the enclosed non-provisional application for the above-referenced provisional application.

Dated: 11/2/99

Mark E. Wiemelt

Mark E. Wiemelt
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VERIFIED STATEMENT CLAIMING SMALL ENTITY STATUS Docket No.
(37 CFR 1.9(f) & 1.27(b)) -- SMALL BUSINESS CONCERN

Applicant or Patentee: J.J.Richardson, Steve Stone and Donald Onken
Serial or Patent No.:
Filed or Issued:
Title: **Sensing Device for Monitoring Conditions at a Remote Location and Method Therefor**

I hereby declare that I am:
[ ] the owner of the small business concern identified below:
[X] an official of the small business concern empowered to act on behalf of the concern identified below:
NAME OF SMALL BUSINESS CONCERN: DSJ Enterprises, Inc.
ADDRESS OF SMALL BUSINESS CONCERN: 2306 Magnolia Drive, Jacksonville, IL 62650

I hereby declare that the above identified small business concern qualifies as a small business concern as defined in 13 CFR § 121.12, and reproduced in 37 CFR § 1.9(d), for purposes of paying reduced fees to the United States Patent and Trademark Office, in that the number of employees of the concern, including those of its affiliates, does not exceed 500 persons. For purposes of this statement, (1) the number of employees of the business concern is the average over the previous fiscal year of the concern of the persons employed on a full-time, part-time or temporary basis during each of the pay periods of the fiscal year, and (2) concerns are affiliates of each other when either, directly or indirectly, one concern controls or has the power to control the other, or a third party or parties controls or has the power to control both.

I hereby declare that rights under contract or law have been conveyed to and remain with the small business concern identified above with regard to the invention described in:
[X] the specification filed herewith with title as listed above.
[ ] the application identified above.
[ ] the patent identified above.

If the rights held by the above identified small business concern are not exclusive, each individual, concern or business organization having rights in the invention must file separate verified statements averring to their status as small entities, and no rights to the invention are held by any person who would not qualify as an independent inventor under 37 CFR § 1.9(c) if that person had made the invention, or to any concern which would not qualify as a small business concern under 37 CFR § 1.9(d) or a nonprofit organization under 37 CFR § 1.9(e).

Each person, concern or organization to which I have assigned, granted, conveyed, or licensed or am under an obligation under contract or law to assign, grant, convey, or license any rights in the invention is listed below:
[X] No such person, concern, or organization exists.
[ ] Each such person, concern or organization is listed below:

Separate verified statements are required from each named person, concern or organization having rights to the invention averring to their status as small entities. (37 CFR § 1.27)

I acknowledge the duty to file, in this application or patent, notification of any change in status resulting in loss of entitlement to small entity status prior to paying, or at the time of paying, the earliest of the

issue fee or any maintenance fee due after the date on which status as a small entity is no longer appropriate. (37 CFR § 1.28(b))

I hereby declare that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true; and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under Section 1001 of Title 18 of the United States Code and that such willful false statements may jeopardize the validity of the application, any patent issued thereon, or any patent to which this verified statement is directed.

NAME OF PERSON SIGNING:
TITLE OF PERSON IF OTHER THAN OWNER: President
ADDRESS OF PERSON SIGNING: X BOX-72 EASTON IL 62633

SIGNATURE X [signature] DATE X 10-29-99

VERIFIED STATEMENT CLAIMING SMALL ENTITY STATUS Docket No.
(37 CFR 1.9(f) & 1.27(b)) -- INDEPENDENT INVENTOR

Applicant or Patentee: J.J.Richardson, Steve Stone and Donald Onken
Serial or Patent No.:
Filed or Issued:
Title: **Sensing Device for Monitoring Conditions at a Remote Location and Method Therefor**

As a below named inventor, I hereby declare that I qualify as an independent inventor as defined in 37 CFR § 1.9(c) for purposes of paying reduced fees to the Patent and Trademark Office described in:
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[ ] the application identified above.
[ ] the patent identified above.

I have not assigned, granted, conveyed or licensed and am under no obligation under contract or law to assign, grant, convey or license, any rights in the invention to any person who would not qualify as an independent inventor under 37 CFR § 1.9(c) if that person had made the invention, or to any concern which would not qualify as a small business concern under 37 CFR § 1.9(d) or a nonprofit organization under 37 CFR § 1.9(e).

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[ ] No such person, concern, or organization exists.
[X] Each such person, concern or organization is listed below:
Donald Onken, of Easton, Illinois Steve Stone, of Virden, Illinois
DSJ Enterprises, Inc., an Illinois corporation

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J.J. Richardson

X _____ X 10-28-99
Signature of inventor Date

VERIFIED STATEMENT CLAIMING SMALL ENTITY STATUS Docket No.
(37 CFR 1.9(f) & 1.27(b)) -- INDEPENDENT INVENTOR

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[ ] the application identified above.
[ ] the patent identified above.

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Each person, concern or organization to which I have assigned, granted, conveyed, or licensed or am under an obligation under contract or law to assign, grant, convey, or license any rights in the invention is listed below:
[ ] No such person, concern, or organization exists.
[X] Each such person, concern or organization is listed below:
J.J. Richardson, of Jacksonville, Illinois Steve Stone, of Virden, Illinois
DSJ Enterprises, Inc., an Illinois corporation

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Donald Onken

X Donald Onken
Signature of inventor

X 10-29-99
Date

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(37 CFR 1.9(f) & 1.27(b)) -- INDEPENDENT INVENTOR

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[ ] the patent identified above.

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Steve Stone

X Steve Stone
Signature of inventor

X 10-28-1999
Date

Patent Application of J.J. Richardson, Steve Stone and Donald Onken

SENSING DEVICE FOR MONITORING CONDITIONS AT A REMOTE LOCATION AND METHOD THEREFOR

PRIORITY

This is a nonprovisional application of provisional patent application Ser. No. 60/113466, filed December 23, 1998.

INCORPORATION BY REFERENCE

The MICROFICHE APPENDIX that is attached hereto for the software program

submission is incorporated by reference herein. The MICROFICHE APPENDIX includes a page of microfiche containing 35 frames.

FIELD OF THE INVENTION

The present invention is directed to a sensing device for monitoring conditions at a remote location and a method therefor. Particularly, the instant invention is for a sensing device that monitors the conditions of a container at a remote location and a method therefor. More particularly, the disclosed invention is for a sensing device that monitors the level of waste materials in a waste disposal container at a remote location and, then, relays this information to allow for the emptying of the waste disposal container, all without incurring a telephone toll charge.

BACKGROUND OF THE INVENTION

The amount of trash is an ever-growing problem. This is especially true in the retail and commercial sectors, where a large amount of refuse is discarded daily. Most businesses have trash bins adjacent to their buildings for dumping the totality of trash collected either daily or throughout the day. The rate at which the garbage piles up in these trash receptacles varies according to factors such as the season, the industry, the location, etc. Consequently, different businesses and different locations of a business may require different pick-up times for their trash bins.

To minimize the cost of hiring commercial trash collection services to pick-up the trash from the trash receptacles, some companies may designate standard pick-up times, such as daily or weekly, even though the trash bins may not be full. Other companies may call commercial

trash collection services only when their trash bins are full. Either way, the company usually must use the telephone to call the commercial trash collection service. The inevitable result is that a telephone charge is incurred.

The detection of the level of trash in trash receptacles is known in the art. Such detection usually entails some device or method used within the receptacle that senses the level of trash. For instance, a photoelectric cell has been employed for this purpose, as described in U.S. Pat. No. 3,765,147 to Ippolito. Another variation measures the pressure exerted on the trash compactor to detect when the receptacle is full, as disclosed in U.S. Pat. No. 4,773,027 to Neumann. Still, U.S. Pat. No. 3,636,863 to Woyden teaches using pressure-sensing means to determine when the trash container is full.

Additionally, it is known in the art to utilize a means for relaying the information regarding the fullness of the trash receptacle to another location, where the information can be processed. Usually, this relaying method encompasses a telephone or cellular phone line. Some of these devices include U.S. Pat. No. 5,558,013 to Blackstone, Jr.; U.S. Pat. Nos. 5,299,493 and 5,303,642 to Durbin et al.; U.S. Pat. No. 5,214,594 to Tyler et al.; and U.S. Pat. Nos. 5,173,866 and 5,016,197 to Neumann et al.

While each of these systems are useful, they are burdened by several significant disadvantages. First, they fail to teach a way to save the expense of having to pay for telephone toll charges when transmitting information regarding the trash receptacles via a telephone line. This charge may be quite expensive, in light of the fact that some systems maintain a multitude of trash containers. Second, they do not allow users to measure the amount of power supply left in the transmitting means. If the power supply runs out, the waste disposal detection system would be rendered useless. Third, the references do not disclose a way to conserve energy and,

thus, allow one to save on more expenses. And, since these references fail to conserve energy, they are not optimally environmentally friendly. Fourth, the references do not disclose a means to verify that the measurements of the waste disposal container are valid, thereby preventing false readings which may also result in unnecessary charges in emptying a container that is not completely full.

BRIEF SUMMARY OF THE INVENTION

The instant invention is for a sensing device that may be used for detecting various conditions at remote locations. In particular, one embodiment of the invention is directed to a sensing device for detecting the conditions of a container at a remote location. Another embodiment would be used to detect conditions in a waste disposal container at a remote location.

Generally, this invention features three main components: a transmitting module, a receiving module and an identifying means. While each transmitting module is paired with one base module, there may comprise a multitude of such pairings at any one remote location to accommodate the number of containers at that location. Moreover, there may be numerous remote locations comprising such pairings.

The invention also comprises a detecting means for detecting the conditions at the remote location. The detected information is sent to the transmitting module, which has a reading means and a transmitting means. The reading means reads the detected information. In practical usage, the transmitting module also has a first power source for supplying power thereto. The first power source has a power level that is also read by the reading means. The transmitting means sends the information pertaining to the conditions of the remote location and the power level of

the first power source to the base module, which is located near the transmitting module. Advantageously, the transmitting module is only turned-on for approximately 10 seconds, during which time it completes all of its functions. This results in substantial savings in energy charges and is environmentally-friendly.

The base module comprises a receiving means, a first processing means and a conveying means. The receiving means receives the transmitted information from the transmitting module and, then, sends the information to the first processing means of the base module. In one embodiment of the present invention, information from containers located at a close proximity to the base module may be sent directly to the first processing means, without utilizing a transmitting module. Additionally, the base module may have a second power source whereby the power level of this power source is also sent to the first processing means. The first processing means selectively processes all of the information it receives to determine which of a list of pre-programmed telephone numbers to call. In other words, each telephone number matches-up with each of the conditions of the remote location, the amount of power supply in the first and second power sources, and the conditions of the containers located at a close proximity to the base module. The conveying means relays the transmitted information by calling the selected telephone number.

An identifying means is used to identify the remote location of the call. This is typically accomplished by identifying the originating telephone number of the remote location. In the most preferred embodiment, the identifying means does not incur a telephone toll charge. This is accomplished through the use of a second microprocessor having a CALLER ID unit that can identify the location of the originating call without having to "answer" or "connect" the call. Once the originating telephone number of the remote location is identified, one embodiment of

the invention would allow for the container or trash receptacle at the remote location to be emptied or for the power level of the first power source to be recharged.

Another embodiment of the present invention is a method of monitoring the conditions at a remote location. Two other embodiments of the invention include: (1) a method for remotely monitoring the conditions of a container; and (2) a method for remotely monitoring the conditions of a trash receptacle.

It is, therefore, an object of the present invention to teach a means for alleviating the problems associated with the prior art systems of trash receptacle detection.

It is an object of the instant invention to provide a sensing device for monitoring conditions at a remote location and a method therefor.

It is also an object of this invention to provide a sensing device for monitoring the conditions of a container at a remote location and a method therefor.

It is another object of the present invention to provide a sensing device for monitoring the conditions of a waste disposal container and a method therefor.

A further object of this invention is to provide a sensing device that does not incur telephone toll charges and a method therefor.

It is also an object of the instant invention to provide a sensing device that measures the power supply of the transmitting means and a method therefor.

Another object of the present invention is to provide a sensing device that conserves the consumption of energy used by the device and a method therefor.

It is a further object of this invention to provide a sensing device that is environmentally friendly and a method therefor.

It is an object of the present invention to provide a means to verify the information

regarding the conditions of a container.

There has thus been outlined, rather broadly, the more important features of the invention in order that the detailed description thereof that follows may be better understood, and in order that the present contribution to the art may be better appreciated. There are, of course, additional features of the invention that will be described hereinafter and that will form the subject matter of the invention. Those skilled in the art will appreciate that the conception, upon which this disclosure is based, may readily be utilized as a basis for the designing of other devices for carrying out the several purposes of the present invention. It is important, therefore, that the invention be regarded as including such equivalent constructions insofar as they do not depart from the spirit and scope of the present disclosure.

BRIEF DESCRIPTION OF THE SEVERAL VIEWS OF THE DRAWINGS

The foregoing and other additional objects of the present invention will be readily appreciated by those skilled in the art upon gaining an understanding of the invention as described in the following detailed description and shown in the accompanying drawings in which:

FIG. 1 is a block diagram illustrating the generalized embodiment of the sensing device of the present invention.

FIG. 2 is a flow diagram showing the steps of the general embodiment of the method of monitoring conditions at a remote location of the present invention.

FIG. 3 is a schematic block diagram displaying another embodiment of the sensing device of the present invention in which the conditions of a container are monitored by the sensing device.

FIG. 4 is a block diagram illustrating one embodiment of the conserving means used in the transmitting module.

FIG. 5 is a flow diagram showing the process of conserving the power level of the first power source in the transmitting module.

FIG. 6A is a flow diagram of one embodiment of the method of monitoring conditions of a waste disposal container at a remote location and matching the conditions to a telephone number.

FIG. 6B is a flow diagram of one embodiment of the method of monitoring conditions of a waste disposal container located at a close proximity to the base module and matching the conditions to a telephone number.

FIG. 6C is a flow diagram of one embodiment of the method of calling the telephone number matched in FIGS. 6A & 6B and conveying information regarding the monitored conditions.

FIG. 7 is a block diagram illustrating one embodiment of the off-hook detecting means used in the base module.

DETAILED DESCRIPTION OF THE INVENTION

Referring to the drawings, FIG. 1 shows a block diagram of four sensing devices **10** (not numbered in FIG. 1) of the instant invention. Each sensing device **10** comprises, generally, detecting means **14**, a transmitting module **18**, a base module **22** and identifying means **26**. The detecting means **14** and the transmitting module **18** are located at a remote location **12** (shown as dotted rectangular areas in FIG. 1). The detecting means **14** detects conditions at the remote location **12**. Line **16** shows that the detected information is sent to the transmitting module **18**.

The transmitting module **18** reads the information before transmitting the information, shown by dotted-line **20**, to the base module **22**.

When the base module **22** receives the transmitted information, it processes the information to determine which of a list **136** of pre-programmed telephone numbers to call (shown as step **38** in FIG. 2). This call is shown by line **24**, which also shows the information being conveyed to the identifying means **26**. As FIG. 1 depicts the general embodiment of this invention, other embodiments will be apparent in the following descriptions of the relevant figures. For instance, since the identifying means **26** necessarily identifies the remote location **12** of the call by identifying a telephone number **48**, it follows that each remote location **12** must have its own originating telephone number **48** (not shown). Also, even though only one identifying means **26** is show in FIG. 1, it will be shown *infra* that there most likely comprises a multitude of identifying means **26** to match-up with the host of different conditions processed by the base module **22**.

FIG. 2 is a flow diagram depicting the generalized method for monitoring conditions at a remote location **12**. Step **28** detects the conditions at the remote location **12.** Step **30** reads the detected conditions. Next, the information regarding the detected conditions are transmitted by step **32** and received by step **34**. The information is processed by step **36** to determine which pre-programmed telephone number **135** to call. Step **38** calls the selected pre-programmed telephone number **135**, while step **40** conveys the transmitted information. The remote location **12** of the call is, then, identified by step **42**. In this embodiment, steps **30** and **32** occur in the transmitting module **18**; steps **34** to **40** occur in the base module **22**; and step **42** occurs in the identifying means **26**.

Another embodiment of this invention is shown in FIG. 3, in which a sensing device **10**

(not numbered in FIG. 3) monitors the conditions of a container **44** at a remote location **12**. The container **44** may be any type of container that holds materials, such as liquids or solids. The conditions of the container **44** include whether the container **44** is full or empty, the level of the contents **45** (not shown) in the container **44**, or any other condition that the user needs to monitor. A detecting means **14** is used to analyze the conditions of the container **44**. Detecting means **14** that are compatible with the instant invention include conventional detecting means **14** disclosed in U.S. Pat. Nos. 3,765,147, 4,773,027, and 3,636,863 (cited above). Preferred detecting means **14** include switch inputs **88** and ultrasonic ranging units **130**. The most preferred ultrasonic ranging units **130** comprise units made by Polaroid.

But, the most preferred detecting means **14** are switch inputs **88**. The switch inputs **88** of this embodiment are connected by wires **47**, also called hard wire inputs **132**, to the container **44**. The contents **45** inside of the container **44** are typically oil and grease. A float **49** is placed on top of the contents **45** whereby the float **49** is connected to a first end **47a** of the wires **47**. The second end **47b** of the wires **47** is connected to the switch inputs **88**, which are themselves secured in the transmitting modules **18**. In operation, the float **49** will rise and fall depending on the level of the contents **45** in the container **44**, and this information will be sent to the switch inputs **88**. Each switch input **88** matches with a condition of the container **44**. The preferred embodiment would utilize three switch inputs **88** to indicate whether the container **44** is 3/4 full (input 3 **88c**), 1/2 full (input 2 **88b**) or 1/4 full (input 1 **88a**). If the container **44** is empty, none of the switch inputs **88a-88c** will be activated.

A further embodiment of the present invention illustrated in FIG. 3 is a first power source **50** that provides power to the transmitting module **18**. The first power source **50** has a power level **52** (not shown) that can be measured by a measuring means **62** (not shown) to determine

when it is low and, thus, needs to be recharged or changed. A first power source **50** that may be used with this invention is a battery supply **50**, most preferably a 9-volt battery (not shown).

The information regarding the conditions of the container **44** is sent by the detecting means **14** to the reading means **46** of the transmitting module **18**. The reading means **46** reads both the information from the detecting means **14** and the power level **52** of the first power source **50**, and transfers the information to the transmitting means **54**. The preferred reading means **46** comprises a combination of at least one transistor **56**, at least one resistor **58** and an encoder **60** per switch **88**, when a preferred switch input **88** is used. The transistor **56** conveys high and low switch information to the encoder **60**, and the resistor **58**, along with a capacitor **61**, limits the current to protect the transistor **56** from damage and noise/static. It is preferred that the transistor **56** comprises a 2N3904 transistor **56**. The resistors **58** comprise 10 kilo-ohm resistors **58a**, while the capacitor **61** comprises a 0.1 microferad-50 volt ceramic capacitor **61a**. In another embodiment of the instant invention, a measuring means **62** is used to measure the power level **52** of the first power source **50**. Thereafter, the measuring means **62** also conveys the power level **52** information to the encoder **60**. It is further preferred that the encoder **60** comprise an encoding integrated circuit (IC) **60a**. The most preferred encoder **60** is a Holtek Encoder HT-12E that is commercially available. The measuring means **62** is preferably one half of an operational amplifier (OpAmp) circuit **64**, a plurality of resistors **58** and a voltage reference **65**. The most preferred OpAmp circuit **64** comprises a model LM2903 OpAmp circuit. The preferred resistors **58** used in the measuring means **62** comprise a 10 kilo-ohm resistor **58a**, a 100 kilo-ohm resistor **58c** and a 7.5 kilo-ohm resistor **58d**. The most preferred voltage reference **65** comprises a 2.5 volt voltage reference having model number LM285-2.5.

Still referring to the same embodiment in FIG. 3, a delaying means **66** (not shown) may

be used to delay the encoder **60** from transmitting the data until all the circuitry **110** (not shown) of the encoder **60** is powered up and stable. The delaying means **66** is preferably the other half of the OpAmp circuit **64** described above used in conjunction with a plurality of resistors **58** and a capacitor **61**. The most preferred OpAmp circuit **64** comprises the model LM 2903 OpAmp circuit identified above. The plurality of resistors **58** most preferably comprises two 10 kilo-ohm resistors **58a** and one 100 kilo-ohm resistor **58c**. It is also preferred that the capacitor **61** comprises a 0.1 microferad capacitor **61a**.

Another embodiment of the transmitting module **18** depicted in FIG. 3 is a conserving means **68** that is used to conserve the power level **52** of the first power source **50**. Preferably, the conserving means **68** comprises an activating means **70** that only activates the first power source **50** of the transmitting module **18** at periodic intervals. The most preferred activating means **70** comprises a slow timing circuit **72** that is shown in more detail in FIGS. 4 and 5 and is discussed *infra*.

Still referring to FIG. 3, the transmitting means **54** preferably comprises an encoder **60**, which is most preferably the same encoder **60** used for the reading means **46**. The encoder **60** transmits data over an RF link **256**, shown by line **20**, to the base module **22**. This is accomplished by using an AM transmitting unit **74** or an FM transmitting unit **76**. Preferably, the AM and FM transmitting units **74** and **76** may comprise the AM-RT4-433 unit **74** or the TXM-433-A unit **76**, respectively, both manufactured by Abacom Technologies. Each bit of information transmitted by the transmitting means **54** represents one condition. For instance, information pertaining to the three different levels of the container **44**-- that is, 3/4 full, 1/2 full and 1/4 full-- and the power level **52** of the first power source **50** comprise four conditions which represents 4-bits of information.

Next, the receiving means **78** of the base module **22** receives the transmission from the transmitting means **54**. In particular, the receiving means **78** comprises a receiver **80** and a decoder **82** (both not shown). In operation, the receiver **80** receives the data sent from the transmitting means **54** and conveys the data to the decoder **82**. The receiving means **78** is preferably an RF receiving unit **81** so that it can receive transmissions over the RF link **256**, shown by line **20**. The preferred receiver **80** comprises either an AM receiver **80a** or an FM receiver **80b**, most preferably either the AM-HRR3-433 receiver or the SILRX-433-A receiver, respectively, both manufactured by Abacom Technologies. The decoder **82** is preferably a Holtek decoder **82**, most preferably the HT-12D unit.

Dip switches **176** (not shown) may be used in both the transmitting module **18** and the base module **22** to change the addresses **188**, respectively, of the encoder **60** and the decoder **82**. This allows for multiple pairings of transmitting modules **18** and base modules **22** at the same remote location **12**, shown in FIG. 1, which results in the detection of a number of containers **44** at the same location **12**. The binary address **177** of a transmitting module **18** is matched with the binary address **177** of a base module **22** so that the two modules **18** and **22** may communicate with each other. The most preferred dip switches **176** are four-position dip switches **178** because they allow for sixteen different addresses **177** to exist at a single location **12**. Preferred four-position dip switches **178** are C&K-BD04 dip switches. It is further preferred that the transmitting module **18** and the base module **22** not be farther than 300 feet apart.

The decoder **82**, then, conveys the received data to the first processing means **84**. Preferably, the first processing means **84** comprises a first microprocessor **86**. The most preferred first microprocessor **86** is the Atmel AT89S8252 microprocessor **86**. A rapid timing circuit **346** is used in conjunction with the first microprocessor **86** to constantly activate the first

microprocessor **86**. The rapid timing circuit **346** preferably comprises a rapid oscillator **206a** and two capacitors **61**. The preferred rapid oscillator **206a** comprises a crystal oscillator **206b**, most preferably an 11.0592 mega-hertz xtal oscillator. The preferred capacitors **61** comprise 33 picofarad ceramic capacitors.

It is further preferred that the base module **22** has six switch inputs **88** (discussed *infra*) and transferring means **90** (not shown), whereby the six switch inputs **88a-88f** convey high/opened **91a** and low/closed **91b** switch information to the transferring means **90** which, then, conveys that information to the first microprocessor **86**. As discussed *supra*, three **88a-88c** of the six inputs **88a-88f** may match-up with the level of the contents in a container, while the other three inputs **88d-88f** may match up with other conditions, such as the level of contents in other containers (not shown). If a switch input **88** is in the high/opened state **91a**, then the first microprocessor **86** will not match the condition with a telephone number **135**. But, if a switch input **88** is in the low/closed state **91b**, then this is considered an "active" state **91b** and the first microprocessor **86** matches the appropriate telephone number **135** with the condition to prepare for that number **135** to be dialed (shown in FIG. 6B). The transferring means **90** protects or buffers the external surroundings from the inputs **88** to the first microprocessor **86** to prevent interference therefrom. The preferred transferring means **90** is an inverter **92**, while the most preferred inverter **92** is a trigger inverter **94**. The most preferred trigger inverter **94** is a Schmidt trigger inverter IC **96** having model number 74HC14.

The base module **22** is powered by a second power source **98**. The second power source **98** is preferably a transformer **100**, most preferably a wall transformer **102** having a 12 volt DC output, such as the 12 volt-500ma DC - CUI STACK#DPD120050-P-5 wall transformer. The wall transformer **102** feeds power, sequentially, to a power input jack **104**, a full wave bridge

circuit **106** and a regulator **108**. The regulator **108**, then, feeds power to the rest of the internal circuitry **110** of the base module **22**. The full wave bridge circuit **106** allows any polarity of DC input to power the base module **22** and is, most preferably, a full wave bridge circuit **106** made up of four 1N4004 diodes **107**. The regulator **108** is most preferably a 5-volt regulator **108**, such as the 7805-voltage regulator unit, that converts the incoming 12 volts DC from the wall transformer **100** to a lower power level of 5 volts.

As a precaution against losing the operating program **112** (disclosed in the MICROFICHE APPENDIX attached hereto and discussed *infra*) that is running the first microprocessor **86**, there is a watchdog IC **114** (not shown) that generates a reset pulse **116** to restart and power-up the first microprocessor **86**. To prevent the watchdog IC **114** from generating the reset pulse **116**, it is preferable to utilize a strobe input **118** in the watchdog IC **114** that is periodically strobed or toggled by the first microprocessor **86**. While the strobe input **118** is toggled, the watchdog IC **114** will not generate a reset pulse **116**. But, if the first microprocessor **86** stops toggling the strobe input **118**, the watchdog IC **114** will, after a set time period, generate a reset pulse **116** to restart the first microprocessor **86**. The most preferred watchdog IC **114** is the Maxim MAXCPA1232uP supervisor unit.

Continuing with FIG. 3, the base module **22** preferably has at least one external first-indicator **120** and means **122** (not shown) for turning on the first-indicator **120**. The first-indicator **120** allows human operators (not shown) to supervise the conditions of the base module **22** by connecting the first-indicator **120** to the first processing means **84** of the base module **22**. The means **122** for turning on the first-indicator **120** most preferably comprises at least one transistor output **124**, while the first-indicator **120** comprises at least one lamp **126**. The most preferred lamp **126** is at least one light emitting diode (LED) **174**. In the most preferred

embodiment, the first processing means **84** relays data to the transistor output **124** which lights the lamp **126**, thus alerting operators on the scene of any problems. The preferred transistor outputs **124** comprise MPS-A18 transistors **125**. The first-indicator **120** can be used to alert operators regarding the different conditions of the remote location **12**, the transmitting module **18** or the base module **22**, depending on the preference of the user. The most preferred conditions indicated comprise: the low power level **52** of the second power source **98** of base module **22**; the different levels of the containers **44**; telephone dialing in progress (not shown or numbered); the low power level **52** of the first power source **50** of the transmitting module **18**; and that valid data has been received from the transmitting module **18**.

At least one second-indicator **194** (not shown in FIG. 3) may be used to supplement the first-indicator **120**. The second-indicator **194** is most preferably also an LED **174**. The specific process encompassing this embodiment is discussed *infra* and illustrated in FIG. 6B. In the preferred embodiment, the first-indicator **120** is a lamp **126** that can be seen from a distance to alert operators of potential problems, while the second-indicator **194** is an LED **174** on the base unit **22** that can be viewed at a close range thereto. Additionally, multiple first-indicators **120** and second-indicators **194** may be utilized to indicate different conditions, a sample of which is illustrated in FIG. 6B and its corresponding discussion *infra*. The most preferred LEDs **174** used for the second-indicators **194** comprise size T-1 LEDs **175**. Resistors **58** may be used in series with the LEDs **175** to limit the current running through the LEDs **175**. Preferred resistors **58** comprise 470-ohm resistors **58b**.

The base module may also have reporting means **128** that report conditions at a close proximity to the base module **22**. FIG. 3 illustrates the reporting means **128** reporting the conditions of a container **44** located near the base module **22**. The reporting means **128** operates

in the same manner as the detecting means **14** described above. As such, the reporting means **128** may comprise any of the types of devices discussed for the detecting means **14**. But, the most preferred reporting means **128** are switch inputs **88** (shown in FIG. 3) and ultrasonic ranging units **130**. Either way, the reporting means **128** utilizes wiring **47** to send data from the container **44** to the first processing means **84** of the base module **22**. The preferred wiring **47** is hard wire inputs **132**. If an ultrasonic ranging unit **130** is used as the reporting means **128**, it would use the first microprocessor's **86** internal timing functions **342** to measure the time it takes for an ultrasonic pulse **344** to travel from the top **44a** (not shown) of a container **44** to the contents **45** therein and, then, back to the top **44a** to compute the level of the contents **45** in the container **44**. The most preferred ultrasonic ranging units **130** comprise units made by Polaroid. However, if the switch inputs **88** are used, they would be used in the same manner as described above for the detecting means **14**-- that is, with a float **49** placed on top of the contents **45** within the container **44**. Most preferably, each of the switch inputs **88a-88f** are connected to connectors **154** (not shown) to facilitate external connections to the reporting means **128**. The preferred connectors **154** comprise dual row 12-pin right angle "Molex Microfit" connectors **154b**.

The conveying means **134** of the base module **22** conveys the data processed by the first processing means **84** to the identifying means **26**, as shown by dotted line **24**. It accomplishes this by calling the telephone number **135** determined by the first processing means **84** which matches each condition with an appropriate telephone number **135**, as selected from a list **136** of pre-programmed telephone numbers, identified in FIG. 3 as a pre-programmed telephone number database **136**. The database **136** is ideally stored in non-volatile memory **138** (not shown) inside the first microprocessor **86**. The selection of the appropriate telephone number **135** by the first processing means **84** is accomplished by the novel software program **112** attached to this patent

application, as disclosed in the MICROFICHE APPENDIX. The MICROFICHE APPENDIX and FIGS. 6A-6B also disclose the process by which the appropriate telephone number **135** is selected.

Still referring to the conveying means **134**, it preferably comprises a microprocessor **140**, most preferably the first microprocessor **86** used for the first processing means **84**. The microprocessor **140** has a modem **142** and an operating program **112** (not shown). Modems **142** are commercially available, but the preferred modem **142** is a Cermetec modem having part number 1786LC.

Another component of the conveying means **134** is telephone lines **146** (shown in FIG. 7) used to convey the data. When telephone lines **146** are used, one of skill in the art will know to use telephone jacks **148** (shown in FIG. 7) in the base module **22** for connecting the telephone lines **146** to the base module **22**. The most preferred telephone jacks **148** comprise Corcom RJ11-2L-S telephone jacks **148**. It is to be understood that cellular telephones **150** may be used as a substitute component for telephone lines **146**, in which case modems **142** adapted for use with cellular telephones **150** are required, along with other devices known in the art for utilizing cellular telephones **150**. Thus, line **24** depicts data transmissions by either telephone lines **146** or cellular telephones **150**. FIG. 7 illustrates an off-hook detecting means **348** that detects whether the telephone line **146** is in use (off-hook) or not in use (on-hook) and is described in detail *infra*.

Updating means **152** (not shown) may be used to update the information stored in both the pre-programmed telephone number database **136** and the operating program **112** of the microprocessor **140**. The most preferred updating means **152** is a connector **154**. The preferred connector **154** comprises the 9-pin female D-subminiature right-angle board mount "Amp 745781-4" connector **154a**.

Usually, electrical noise on telephone lines **146** damages the circuitry **156** traveling between the modem **142** and the telephone lines **146**. Protecting means **158** (not shown) are preferably used to protect the circuitry **156**. Preferable protecting means **158** include additional circuitry **160** in the form of high voltage capacitors **162**, ferite beads **164**, resetable fuses **166** and surge protectors **168**. The most preferred ferite beads **164** comprise the "Fair-Rite" 264366611 ferite bead **164a** or the "Fair-Rite" 2943666661 **164b** ferite bead. The most preferred resetable fuses **166** comprise Raychem Polyswitch TR600-150 fuses **170**, while the most preferred surge protectors **168** comprise Teccor Sidactor P3203AB surge protectors **172**. When cellular telephones **150** are used as the conveying means **134**, electrical noise is not a problem, such that protecting means **158** are not required.

Still referring to FIG. 3, the identifying means **26** receives the data sent by the conveying means **132** of the base module **22.** Specifically, a second processing means **180** having a CALLER ID unit **182** is the preferred identifying means **26**. If the second processing means **180** is not used, a CALLER ID unit **182** may be used by itself as the identifying means **26**. Either way, the CALLER ID unit **182** is the component that initially receives the data sent by the conveying means **132**. Preferable CALLER ID units **182** comprise the "WhozzCalling?Lite4"(TM) and "Whozz Calling?Lite8"(TM) units made by Zeus Phonstuff, Inc., Norcross, Georgia, that is commercially available. Furthermore, a printer **184** may be connected to the second processing means **180** so that the data identified by the identifying means **26** may be printed as a written record. The most preferred second processing means **180** is a second microprocessor **190**. It is also preferred that the second microprocessor **190** utilizes a hard drive or a floppy drive (not shown), or most preferably both, to store data comprising information regarding the location **12** of the incoming call.

Once the identifying means **26** identifies the remote location **12** of the originating call to the pre-programmed telephone number **135**, a disconnecting means **186** (not shown) may be used to disconnect the call, thereby not incurring a telephone toll charge. This results in substantial savings for the user. The disconnecting means **186** is most preferably located in the base module **22** and connected to the conveying means **132**. The typical disconnecting means **186** comprises a modem **142**, preferably the same modem **142** used to call the identifying means **26** described above. Further, the disconnecting means **186** optimally allows the telephone call to ring for a time period equivalent to four rings before disconnecting the call, so that the identifying means **180** may identify the remote location **12** of the call. The number of telephone rings may vary depending on one's preference.

Since the conveying means **132** calls different pre-programmed telephone numbers **135** for different conditions, one can determine from observing the identifying means **26** which condition corresponds with which remote location **12**. As a result, one can send, shown by line **200**, either emptying means **196** or recharging/changing means **198**, or both, to the appropriate remote location **12** or to a location at a close proximity to the base module **22** to remedy the problem. It is most preferable that the second processing means **180** comprise software **202** to make the decision shown by line **200**. This software **202** could also be programmed to print out a report detailing the conditions from the transmitting module **18** and/or the base module **22**. Software **202** that is compatible with the second processing means **180** comprises the "Callwhere(R) Plus for Windows" program made by A&A TeleData, Austin, Texas, that is commercially available.

Emptying means **196** may involve using a human operator (not shown) to physically empty the container **44** or it may involve contacting a commercial service (not shown) to empty

the container **44**. Recharging means **198** include either recharging or changing the first **50** or second **98** power source.

Referring now to FIG. 4, the conserving means **68** of the transmitting module **18** is shown in a block diagram. The specific embodiment displayed is a slow timing circuit **72** (indicated by a dotted rectangular area) that only activates the transmitting module **18** at periodic intervals. The slow timing circuit **72** comprises a counter **204** having an oscillator **206** and an RC time constant **208**. The oscillator **206** preferably comprises a slow oscillator **206c**. The RC time constant **208** controls the frequency **210** (not shown) of the slow oscillator **206c**, as shown by line **212**. The counter **204** triggers a one-shot circuit **214** within the slow timing circuit **72** when a pre-selected count **216** is reached, shown by line **218**. The one-shot circuit **214** is only activated for 10 seconds so as to conserve energy. Thereafter, the one-shot circuit **214** turns on the first power source **50** of the transmitting module **18**, depicted by line **220**. The activated one-shot circuit **214** also resets the counter **204** back to its starting count **216**, illustrated by line **222**. The most preferred counter **204** is a CD4060BCN counter **204a**, while the most preferred one-shot circuit **214** is a CD4538BCN one-shot circuit **214a**.

FIG. 5 shows a flow diagram of the process of conserving the power level **52** of the first power source **50**. A starting count **224** is initially set at zero. Then, step **226** shows that the counter **204** starts the count. Step **228** decides whether the pre-selected count **216** has been reached. The most preferred pre-selected count **216** set to five hours, but one of skill in the art will know that the pre-selected count **216** is variable depending on one's preferences and needs. If the pre-selected count **216** has not been reached, then the count continues, as shown by line **229a**. But, if the pre-selected count **216** is reached, line **229b** shows that the next step **230** is to trigger the one-shot circuit **214** for 10 seconds. Once the one-shot circuit **214** is triggered, step

232 activates the first power source 50 of the transmitting module 18 and step 234 resets the counter 204 back to the starting count to start the process again, all within the 10 seconds of activation. In the manner described above, the power level 52 of the first power source 50 is not continually used; rather, the first power source 50 is only activated at periodic intervals for merely 10 seconds to run the transmitting module 18. The transmitting module 18 uses the most power when it is transmitting data during this short time period. Otherwise, the conserving means 68 causes the transmitting module 18 to "sleep" and not consume the power level 52 of the first power source 50. This results in large monetary savings for the user and is also environmentally friendly.

FIG. 6 is split into three flow diagrams which, in totality, illustrate one preferred embodiment of the instant invention in which: FIG. 6A illustrates the process of monitoring the conditions of a waste disposal container 236 at a remote location 12; FIG. 6B shows the process of monitoring the conditions of a waste disposal container 236 at a close proximity to the base module 22; and FIG. 6C illustrates the process of conveying the conditions monitored by FIGS. 6A and 6B so that appropriate steps are taken to remedy the conditions. Both FIG. 6A and FIG. 6B emphasize the steps of matching the monitored conditions with one of the telephone numbers 135 selected from the list of pre-programmed telephone numbers 136.

Referring firstly to FIG. 6A, step 238 detects the conditions of the waste disposal container 236 at the remote location 12. Step 240 measures the power level 52 of the first power source 50. Step 241 activates the transmitting module 18 using the conserving means 68. Step 242 reads the information obtained during steps 238 and 240. Next, the information is encoded by step 244. Transmission of the information is delayed by step 246 until all circuitry 110 is powered up and stable. Step 248 decides whether all of the circuitry 110 is powered up and

stable. If not, line **250** shows that the transmission must be delayed by step **246** until the answer to step **248** is in the affirmative. But, if the answer to step **248** is yes, then line **252** indicates that the information is transmitted by step **254**, which shows the process of transmitting the information over the preferred RF link **256** (not shown). After the information is transmitted by step **254**, dotted-line **257a** shows that the transmitting module **18** goes to sleep as step **257**. Dotted-line **257b** illustrates that the transmitting module **18** sleeps until it is activated again by step **241**.

The transmitted information is received by step **258** and decoded by step **260**. Step **262** shows that the information must be firstly verified, because an initial transmission by the transmitting step **254** may contain a false reading of the level of the contents **45** in the waste disposal container **236**. To prevent the processing of false readings, a second transmission received by the receiving step **258** must contain the same information as the initial transmission for the information to be considered valid. The initial and second transmission-- called consecutive transmissions-- must necessarily occur at five-hour intervals in the preferred emobdiment, because the transmitting module **18** is only activated by the activating step **241** every five hours. For example, if, during the initial transmission, the contents **45** in the waste disposal container **236** did not settle, any readings of such information would be inaccurate. Thus, during the second transmission, if the contents **45** have settled, then a different reading would be taken, and the information received from consecutive transmissions of step **254** would not be the same and, hence, would not be firstly verified by step **262**. Consequently, only two consecutive transmissions having the same readings would comprise valid information.

Additionally, to further ensure that the information transmitted by step **254** is valid, receiving step **258** disables the base unit **22** for twenty seconds after it receives information from

the transmitting module **18**. As a result, no information, whether containing false readings or not, may be received by step **258** during this twenty-second period.

Continuing with FIG. 6A, step **264** decides whether the transmitting step **254** sent two consecutive transmissions. If not, then line **266** shows that the receiving step **258** is revisited to determine whether more transmissions are forthcoming from step **254**. If the transmitting step **254** does send two consecutive transmissions, at five-hour intervals, then line **268** leads to a series of steps which match a condition at the remote location **12** with a telephone number **135** from the list **136** of pre-programmed telephone numbers.

Step **270** decides whether the remote waste disposal container **236** is 3/4 full or more. If so, then line **271a** leads to step **300** which matches ("matching step") that condition with a telephone number **135**. It is important to note that the matching steps **300** disclosed in FIGS. 6A-6C are all typically conducted by the novel software program **112** disclosed in the MICROFICHE APPENDIX attached hereto. If the answer to step **270** is in the negative, line **271b** leads to step **272** to determine whether the remote waste disposal container **236** is 1/2 full or more. If so, then line **273a** leads to the matching step **300** to match that condition with a telephone number **135**. If the answer to step **272** is in the negative, then line **273b** leads to step **274** to decide whether the remote container **236** is 1/4 full or more. If so, then line **275a** leads to the matching step **300**. If not, then line **275b** leads to step **276**.

Step **276** determines whether the remote trash container **236** just made a transition from being either 1/2 or 3/4 full, or more, to being empty. If so, line **277a** leads to the matching step **300**. If not, line **277b** leads to step **278**, which determines whether the power level **52** of the first power source **50** is low. If the power level **52** is low, line **279a** leads to the matching step **300**. But if the power level is not low, line **279b** leads to step **280** to determine whether the

transmitting module **18** is responding properly. If the transmitting module **18** is not responding properly, line **281a** leads to the matching step **300**. However, if the transmitting module **18** is responding properly, then line **281b** indicates that receiving step **258** is revisited to prepare to receive another transmission from the transmitting module **18**. Incidentally, the order of steps **270-280** is not of paramount importance. One skilled in the art will know that these steps may be arranged in any order to suit one's preference.

Monitoring the transition of the remote trash container **236** from being 1/2 or 3/4 full, or more, to being empty via step **276** is important because experience shows that some remote trash containers **236**, and other types of containers **44**, may have their contents **45** stolen. It is favorable, then, for the activating step **241** to be "awakened" immediately in such circumstances so that this information may be transmitted by step **254**. The quicker activation of step **241** may be adjusted depending on the user's preference. Thus, once this transition is detected and received by step **258**, then step **300** matches the appropriate telephone number **135** with this condition, thereby allowing the steps illustrated in FIG. 6C (discussed below) to convey this transition. The desired result is to catch potential thieves in the act, or shortly thereafter.

Referring now to FIG. 6B, step **282** reports the conditions of any waste disposal containers **236** in close proximity to the base module **22**, and step **284** reports the power level **52** of the second power source **98**. Step **286** decides whether the power level **52** of the second power source **98** is low. If the second power source **98** is at low power, line **287a** will lead to step **300** to match this condition with a telephone number **135** from the list **136** of pre-programmed telephone numbers. Step **300** is the same as the match step **300** disclosed in FIG. 6A, so it will als be termed the "matching step" **300**. If, however, the power level **52** of the second power source **98** is not low, then line **287b** will lead to step **284** to continue reporting the

power level **52**. Steps **284-286** are preferably utilized when the second power source **98** is a battery, since batteries tend to be used up sooner than the power from a transformer **100** (disclosed above).

The information reported by step **282** must be secondly verified by step **288**. Step **288** is similar to step **262** (shown in FIG. 6A and its accompanying discussion) in that the former ensures that no false readings are reported by step **282**. However, since step **282** is not subject to the five-hour interval transmissions of step **254** (shown in FIG. 6A), another verifying technique must be utilized. As such, the secondly verifying step **288** is accomplished by the preferred switch inputs **88** staying in the same high/opened or low/closed state for three seconds to allow the contents **45** of the waste disposal container **236** to stabilize or to allow for any electrical noise to be ignored before the information is considered valid. Step **290** determines whether the information reported by step **282** is constant for three seconds. If not, line **291a** returns to step **288** to attempt to verify the reported information. If so, line **291b** shows that the reported information is considered valid.

Still referring to FIG. 6B, step **292** determines whether the waste disposal container **236** located at a close proximity to the base module **22** is 3/4 full or more. If so, line **293a** leads to step **294** to light a green **174a**, yellow **174b** and red **174c** light emitting diode ("LED"). The LEDs **174a-174c** disclosed in FIG. 6B provide operators stationed at or near the base module **22** with notice of the level of the trash container **236** located near the base module **22**. Line **295** indicates that once the LEDs **174a-174c** are lit, the condition is matched with a telephone number **135** by the matching step **300.** If the answer to step **292** is in the negative, line **293b** leads to step **296** to determine whether the waste disposal container **236** is 1/2 full or more. If so, line **297a** leads to step **298** to light the green **174a** and yellow **174b** LED. Then, line **299** leads to the

matching step **300**. But if the container **236** is not 1/2 full or more, line **279b** leads to step **302** to decide whether the trash container **236** is 1/4 full or more. If so, line **303a** leads to step **304** to light the green LED **174a**. Thereafter, line **305** leads to the matching step **300**. If the answer to step **302** is in the negative, then line **303b** leads to step **306** to determine whether the waste disposal container **236** has undergone the transition from 1/2 or 3/4 full, or more, to empty (as discussed above). If this transition is detected, line **307a** leads to matching step **300**. However, if the answer to the transition step **306** is in the negative, line **307b** leads back to step **282** to restart the reporting process for the waste disposal container **236** at close proximity to the base module **22**. One of skill in the art will know that the color of the LEDs **174a-174c** in the above-described embodiment may be varied according to one's desires and tastes. These descriptions are merely a sample of one of the preferred embodiments of the disclosed invention.

Referring to FIG. 6C, matching step **300** is shown to indicate the position where FIGS. 6A-6B leave off and where FIG. 6C begins. After telephone number **135** is matched with the appropriate condition by step **300**, step **308** sends the information comprising the matching telephone number **135** to step **310**, which detects whether the telephone line **146** is on-hook (not in use) or off-hook (in use), discussed *infra* and shown in more detail in a block diagram in FIG. 7. Step **312** is the decision step that determines whether the telephone line **146** is on- or off-hook. If the telephone line **146** is off-hook, the answer to step **312** is in the negative and line **313a** indicates that step **310** is revisited to repeat the off-hook detection. But, if step **312** determines that the telephone line **146** is on-hook, the answer to step **312** is positive and line **313b** shows that the process proceeds to step **314** to call the matched telephone number **135**. Once the telephone number **135** is called, step **316** conveys the information by way of having an originating telephone number **48** that step **318** identifies. Once the originating telephone number

48 has been identified, step 320 disconnects the call. Step 320 most preferably disconnects the call after the fourth ring, or another set time period. This prevents a telephone toll charge from being incurred, since the call is not answered. Thereafter, either one of steps 322 or 324 may take place depending on whether the waste disposal container 236 needs to be emptied (step 322) or one of the first 50 or second 98 power sources needs to be recharged or changed (step 324).

Additionally, it should be noted that after the call is disconnect by step 320, the base module 22 prepares to receive information from the transmitting module 18 (step 258 in FIG. 6A) and to report the conditions of the trash container 236 located close to the base module 22 (step 282 in FIG. 6B) and the power level 52 of the second power source 98 (step 284 in FIG. 6B).

When the telephone line 146 of the base module 22 is not in use (on-hook), the modem 142 of the conveying means 134 will successfully be able to call the selected telephone number 135. But, if the telephone line 146 is already being used, or off-hook, the modem 142 will not be able to make a call on that line 146. The problem of not knowing whether the telephone line 146 is on-hook or off-hook is solved by an off-hook detecting means 348 that is illustrated in a block diagram in FIG. 7. Referring to FIG. 7, the off-hook detecting means 348 (not shown in FIG. 7) detects when the telephone line 146 is in use and sends the off-hook information to the first microprocessor 86, which does not allow the modem 142 to call the selected telephone number 135. Likewise, the off-hook detecting means 348 also detects when the telephone line 146 is on-hook and, thereby, sends this information to the first microprocessor 86 to allow the modem 142 to make the call.

The preferred off-hook detecting means 348 comprises a plurality of diodes 350 connected to the telephone lines 146 leading, at one end (not numbered), to a telephone jack 148

and, at another end (not numbered), to a plurality of discrete circuits **352**. The discrete circuits **352** lead to an opto-isolator IC (opto-coupler IC) **354** that provides the first microprocessor **86** with the on-hook and off-hook information. In a preferred embodiment of the off-hook detecting means **348** as shown in FIG. 7, the preferred diodes **350** comprise four diodes **350a-350d** in a full wave bridge configuration **356**. The diodes **350a-350d** generate positive (+) and negative (-) voltage changes, whereby a positive voltage change represents that the telephone line **146** is on-hook and a negative voltage change represents that the telephone line **146** is off-hook. The preferred discrete circuits **352** comprise a first discrete circuit **352a** and a second discrete circuit **352b**, whereby the first discrete circuit **352a** detects the positive or negative voltage change from the diodes **350a-350d** and relays that information to the second discrete circuit **352b**. The second discrete circuit **352b**, then, becomes activated and further relays the on-hook/off-hook information to the opto-isolator IC **354**. The opto-isolator IC **354** preferably comprises an LED **174** and a phototransistor **358**. The LED **174** is lit when the telephone line **146** is off-hook and dim when on-hook. Once the information passes through the LED **174**, it is sent to the phototransistor **358** that is light-activated and relays the information from the LED **174** to the first microprocessor **86**. The first microprocessor **86** will, therefore, be informed as to whether the telephone line **146** is on- or off-hook.

This invention has great utility in the waste disposal industry, but it may also be useful in other industries where remote containers or locations need to be monitored. Hence, while the invention has been described in connection with a preferred embodiment, it will be understood that it is not intended that the invention be limited to that embodiment. On the contrary, it is intended to cover all alternatives, modifications and equivalents as may be included within the spirit and scope of the invention as disclosed.

As to the manner of usage and operation of the instant invention, same should be apparent from the above disclosure, and accordingly no further discussion relevant to the manner of usage and operation of the instant invention shall be provided.

With respect to the above description then, it is to be realized that the optimum dimensional relationships for the parts of the invention, to include variations in size, materials, shape, form, function and manner of operation, assembly and use, are deemed readily apparent and obvious to one skilled in the art, and all equivalent relationships to those illustrated in the drawings and described in the specification are intended to be encompassed by the present invention.

Therefore, the foregoing is considered illustrative of only the principles of the invention. Further, since numerous modifications and changes will readily occur to those skilled in the art, it is not desired to limit the invention to the exact construction and operation shown and described, and accordingly, all suitable modifications and equivalents may be resorted to, falling within the scope of the invention.

CLAIMS

What is claimed is:

1. A sensing device for monitoring conditions at a remote location having an originating telephone number, the sensing device comprising:

(a) detecting means for detecting the conditions at the remote location;

(b) a transmitting module having a first power source, the transmitting module further comprising:

(1) reading means for reading the conditions at the remote location, and

(2) transmitting means for transmitting information regarding the conditions at the remote location;

(c) a base module having a list of pre-programmed telephone numbers that correspond to each of the conditions at the remote location, the base module further comprising:

(1) receiving means for receiving the transmitted information from the transmitting module,

(2) first processing means for selectively processing the transmitted information to determine which pre-programmed telephone number to call, and

(3) conveying means for conveying the transmitted information by using a telephone line to call the pre-programmed telephone number determined by the first processing means; and

(d) identifying means for identifying the remote location of the call to the pre-programmed telephone number,

whereby the conditions at the remote location are monitored by the identifying means.

2. The sensing device of claim 1 wherein the conditions at the remote location comprise conditions of a container at the remote location.

3. The sensing device of claim 2 wherein the container comprises a waste disposal container, the waste disposal container being filled with waste material therein.

4. The sensing device of claim 3 wherein the conditions of the waste disposal container comprise different levels of waste material in the waste disposal container.

5. The sensing device of claim 4 further comprising emptying means for emptying the waste disposal container, whereby the emptying means is activated by the identifying means to empty the waste disposal container.

6. The sensing device of claim 5 wherein the emptying means comprises at least one person physically emptying the waste disposal container.

7. The sensing device of claim 5 wherein the emptying means comprises routing at least one vehicle to the remote location to empty the waste disposal container.

8. The sensing device of claim 1 wherein the first power source comprises a battery supply.

9. The sensing device of claim 1 wherein the first power source comprises a first power source having a power level.

10. The sensing device of claim 9 further comprising conserving means for conserving the power level of the first power source.

11. The sensing device of claim 10 wherein the conserving means comprises activating means for periodically activating the transmitting module, whereby the first power source is only utilized when the activating means activates the transmitting module.

12. The sensing device of claim 11 wherein the activating means comprises a slow timing circuit.

13. The sensing device of claim 12 wherein the slow timing circuit comprises:

(a) a counter having an oscillator therein, the counter further having a starting count and a pre-selected count; and

(b) a one-shot circuit,

whereby the counter triggers the one-shot circuit when the pre-selected count is reached, and the one-shot circuit thereby activates the transmitting module and resets the counter back to the starting count.

14. The sensing device of claim 13 wherein the oscillator comprises an oscillator having a frequency controlled by an RC time constant.

15. The sensing device of claim 13 wherein the oscillator comprises a slow oscillator.

16. The sensing device of claim 15 wherein the pre-selected count is set at five hours.

17. The sensing device of claim 9 further comprising measuring means for measuring the power level of the first power source, whereby the measuring means conveys information regarding the power level to the reading means.

18. The sensing device of claim 17 wherein:

(a) the reading means reads the conditions at the remote location and the power level of the first power source; and

(b) the transmitting means transmits information regarding the conditions at the remote location and the power level of the first power source.

19. The sensing device of claim 18 wherein the measuring means, the readings means and the transmitting means of the transmitting module, respectively, comprise:

(a) a measuring means having a first half of an OpAmp circuit;

(b) a reading means having at least one transistor, at least one resistor and an encoder, whereby the transistor and the resistor convey high and low switch information to the encoder, further whereby the first half of the OpAmp circuit conveys the power level information of the first power source to the encoder; and

(c) a transmitting means using the encoder to transmit information regarding the

conditions at the remote location and the power level of the first power source to the base module.

20. The sensing device of claim 19 wherein the encoder comprises an encoding IC.

21. The sensing device of claim 19 further comprising delaying means for delaying the encoder from transmitting the information regarding the conditions at the remote location and the power level of the first power source until the circuitry is at full power and stable.

22. The sensing device of claim 21 wherein the delaying means comprises a second half of the OpAmp circuit.

23. The sensing device of claim 9 further comprising a second power source for providing power to the base module.

24. The sensing device of claim 23 wherein the second power source comprises a second power source having a power level.

25. The sensing device of claim 24 wherein the identifying means monitors the power levels of the first power source and the second power source.

26. The sensing device of claim 24 wherein the second power source comprises a transformer.

27. The sensing device of claim 26 wherein the transformer comprises a wall transformer.

28. The sensing device of claim 27 wherein the wall transformer comprises a wall transformer having a 12-volt DC output.

29. The sensing device of claim 24 further comprising:

(a) internal circuitry, the internal circuitry being located within the base module;

(b) a regulator, the regulator being connected to the internal circuitry;

(c) a full wave bridge circuit, the full wave bridge circuit being connected to the regulator, the full wave bridge circuit further allowing any polarity of DC input to power the base module; and

(d) a power input jack, the power input jack being connected to the full wave bridge circuit and to the second power source,

whereby the second power source provides power to the power input jack, the power inputs jack provides power to the full wave bridge circuit, the full wave bridge circuit feeds power to the regulator, the regulator further provides power to the rest of the internal circuitry.

30. The sensing device of claim 29 wherein the regulator comprises a 5-volt regulator.

31. The sensing device of claim 24 further comprising recharging means for recharging the first power source and the second power source, whereby the recharging means is

activated by the identifying means.

32. The sensing device of claim 24 wherein the list of pre-programmed telephone numbers further correspond to the power levels of the first power source and the second power source.

33. The sensing device of claim 24 wherein the base module comprises a base module having:

(a) at least one external first-indicator, the first-indicator allowing human operators to supervise the conditions processed by the first processing means at a distance from the base module; and

(b) at least one second-indicator, the second-indicator allowing human operators to supervise the conditions processed by the first processing means at a close proximity to the base module,

whereby the first processing means relays the conditions to both the first-indicator and the second-indicator, and the first-indicator and second-indicator indicates conditions by emitting a light.

34. The sensing device of claim 33 wherein the first-indicator comprises at least one lamp.

35. The sensing device of claim 33 wherein the second-indicator comprises at least one light emitting diode.

36. The sensing device of claim 1 wherein the transmitting means comprises an encoder

37. The sensing device of claim 36 wherein the encoder comprises an encoder that transmits data over an RF link.

38. The sensing device of claim 1 wherein the receiving means of the base module comprises a receiver and a decoder, whereby the receiver receives the transmitted information from the transmitting means and relays the information to the decoder, and the decoder conveys the transmitted information to the first processing means.

39. The sensing device of claim 38 wherein the receiver comprises an RF receiver.

40. The sensing device of claim 38 wherein the decoder comprises a decoding IC.

41. The sensing device of claim 1 wherein the first processing means of the base module comprises a first microprocessor.

42. The sensing device of claim 41 wherein the detecting means comprises at least one ultrasonic ranging unit, the ultrasonic ranging unit using the first microprocessor's internal timing functions to detect the conditions at the remote location.

43. The sensing device of claim 41 wherein the detecting means comprises remote sensors.

44. The sensing device of claim 41 wherein the detecting means comprises at least one switch input.

45. The sensing device of claim 44 wherein the detecting means comprises six switch inputs.

46. The sensing device of claim 45 further comprising transferring means, whereby the six switch inputs convey high and low switch information to the transferring means, and the transferring means convey the high and low switch information to the first microprocessor.

47. The sensing device of claim 46 wherein the transferring means comprises an inverter.

48. The sensing device of claim 47 wherein the inverter comprises a trigger inverter.

49. The sensing device of claim 48 wherein the trigger inverter comprises a Schmidt trigger inverter IC.

50. The sensing device of claim 41 further comprising:

(a) an operating program, the operating program being contained in the first

microprocessor; and

(b) a watchdog IC having a strobe input, the watchdog IC generating a reset pulse to restart the first microprocessor in case the operating program is lost,

whereby the first microprocessor toggles the strobe input to prevent the watchdog IC from generating a reset pulse.

51. The sensing device of claim 41 wherein the conveying means comprises a conveying microprocessor having a modem and an operating program.

52. The sensing device of claim 51 wherein the conveying microprocessor comprises the first microprocessor used for the first processing means.

53. The sensing device of claim 52 further comprising updating means for updating the list of pre-programmed telephone numbers stored in the base module.

54. The sensing device of claim 53 wherein the updating means comprises an updating means for updating the pre-programmed telephone numbers stored in non-volatile memory inside the first microprocessor.

55. The sensing device of claim 52 further comprising updating means for updating the operating program of the first microprocessor.

56. The sensing device of claim 53 or 55 wherein the updating means comprises a

connector.

57. The sensing device of claim 1 further comprising a telephone jack, the telephone jack allowing direct connection to the telephone line of the base module.

58. The sensing device of claim 57 further comprising means for detecting when the telephone line is off-hook.

59. The sensing device of claim 58 wherein the off-hook detecting means comprises:

(a) a plurality of diodes, the diodes being connected to the telephone lines of the base module, the diodes generating positive and negative voltage changes;

(b) a plurality of discrete circuits, the discrete circuits detecting the positive and negative voltage changes generated by the diodes; and

(c) an opto-isolator IC, the opto-isolator IC receiving the voltage change information from the discrete circuits and relaying the voltage change information to the first processing means,

whereby the positive voltage change represents that the telephone line is on-hook, and the negative voltage change represents that the telephone line is off-hook.

60. The sensing device of claim 59 wherein the plurality of diodes comprise four diodes in a full wave bridge configuration.

61. The sensing device of claim 59 wherein the plurality of discrete circuits comprise:

(a) a first discrete circuit, the first discrete circuit detecting the voltage change information from the diodes; and

(b) a second discrete circuit, the second discrete circuit receiving the voltage change information from the first discrete circuit and becoming activated thereby,

whereby the activated second discrete circuit relays the voltage change information to the opto-isolator IC.

62. The sensing device of claim 59 wherein the opto-isolator IC comprises:

(a) a light emitting diode, the light emitting diode receiving the voltage change information from the discrete circuits, the light emitting diodes being lit if the telephone line is off-hook and staying dim if the telephone line is on-hook; and

(b) a phototransistor, the phototransistor receiving the voltage change information from the light emitting diode and relaying the voltage change information to the first processing means.

63. The sensing device of claim 1 further comprising disconnecting means for disconnecting the call to the pre-programmed telephone number after a predetermined number of rings, whereby the disconnecting means prevents the call from incurring a telephone toll charge.

64. The sensing device of claim 63 wherein the disconnecting means comprises a modem.

65. The sensing device of claim 63 wherein the predetermined number of rings

comprises four rings.

66. The sensing device of claim 1 wherein the identifying means comprises a second processing means and a CALLER ID unit, the CALLER ID unit being connected to the second processing means.

67. The sensing device of claim 66 wherein the second processing means comprises a second microprocessor.

68. The sensing device of claim 1 wherein the identifying means comprises a CALLER ID unit.

69. The sensing device of claim 1 wherein the base module comprises a base module having reporting means for reporting conditions at a close proximity to the base module.

70. The sensing device of claim 69 wherein the reporting means comprises hard wire inputs in the base module.

71. The sensing device of claim 69 wherein the reporting means comprises an ultrasonic ranging unit.

72. A method of monitoring conditions at a remote location, comprising the steps of:

(a) detecting the conditions at the remote location;

(b) reading the conditions at the remote location;

(c) transmitting information regarding the conditions at the remote location;

(d) receiving the transmitted information;

(e) selectively processing the transmitted information to determine which of a list of pre-programmed telephone numbers to call;

(f) calling the pre-programmed telephone number;

(g) conveying the information; and

(g) identifying the remote location of the call.

73. The method of claim 72 wherein the conditions at the remote location comprise conditions of a container at the remote location.

74. The method of claim 73 wherein the container comprises a waste disposal container, the waste disposal container being filled with waste material therein.

75. The method of claim 74 further comprising the step of emptying the waste disposal container, the emptying step being activated by the identifying step.

76. The method of claim 75 wherein the emptying step is accomplished by at least one person emptying the waste disposal container.

77. The method of claim 75 wherein the emptying step is accomplished by routing at least one vehicle to the remote location to empty the waste disposal container.

78. The method of claim 72 wherein the detecting step comprises using remote sensors.

79. The method of claim 72 wherein the detecting step comprises using switch inputs.

80. The method of claim 72 wherein the detecting step comprises using an ultrasonic ranging unit.

81. The method of claim 72 wherein the reading step and the transmitting step occur in a transmitting module.

82. The method of claim 81 further comprising the step of providing a first power source to the transmitting module, the first power source having a power level.

83. The method of claim 82 further comprising the step of measuring the power level of the first power source.

84. The method of claim 83 further comprising the step of conserving the power level of the first power source.

85. The method of claim 83 wherein the reading step further comprises the step of reading the power level of the first power source.

86. The method of claim 85 further comprising the step of encoding the information containing the conditions of the remote location and the power level of the first power source.

87. The method of claim 86 further comprising the step of delaying the transmitting step, the delaying step allowing all circuitry of the transmitting module to be powered up and stable.

88. The method of claim 87 wherein the transmitting step occurs over an RF link.

89. The method of claim 72 wherein the receiving step, the selectively processing step, the calling step and the conveying step all occur in a base module.

90. The method of claim 89 wherein the receiving step further comprises the step of decoding the information received from the transmitting step.

91. The method of claim 89 further comprising the step of providing a second power source to the base module, the second power source comprising a power level.

92. The method of claim 91 further comprising the step of reporting conditions at a close proximity to the base module.

93. The method of claim 91 wherein the conditions at the close proximity to the base

module comprise conditions of a container at the close proximity to the base module.

94. The method of claim 91 wherein the conditions at the close proximity to the base module comprise the power level of the second power source.

95. The method of claim 92 wherein the selectively processing step comprises the steps of:

(a) firstly verifying the information received by the receiving step;

(b) secondly verifying the information received by the reporting step;

(c) matching a condition with a telephone number from the list of pre-programmed telephone numbers, the condition being verified by the firstly verifying step and the secondly verifying step; and

(d) sending the information regarding the condition to the calling step.

96. The method of claim 95 wherein the firstly verifying step comprises the step of waiting for two consecutive transmissions of the same information from the transmitting step, the waiting step ensuring that the transmissions comprise valid information.

97. The method of claim 95 wherein the secondly verifying step comprises the step of maintaining the reported information at high or low state for at least three seconds, the maintaining step ensuring that the information from the reporting step is valid.

98. The method of claim 95 wherein the matching step comprises the steps of:

(a) firstly matching the condition obtained from the receiving step and the reporting step with one of a plurality of switch inputs; and

(b) secondly matching the condition with the telephone number from the list of pre-programmed telephone numbers.

99. The method of claim 98 wherein the firstly matching step comprises the step of matching one of the switch inputs with the condition as follows:

(a) matching switch input 1 with the condition that the container is 1/4 full;

(b) matching switch input 2 with the condition that the container is 1/2 full; and

(c) matching switch input 3 with the condition that the container is 3/4 full.

100. The method of claim 98 further comprising the step of indicating each condition matched by the matching step, the indicating step allowing human operators to supervise the matched conditions.

101. The method of claim 100 wherein the indicating step comprises the steps of:

(a) firstly indicating at a distance from the base module each condition matched by the matching step, the firstly indicating step allowing human operators to supervise the matched conditions at a distance from the base module; and

(b) secondly indicating at a close proximity to the base module each condition matched by the matching step, the secondly indicating step allowing human operators to supervise the matched conditions at a close proximity to the base module.

102. The method of claim 101 wherein the firstly indicating step is accomplished with lamps.

103. The method of claim 101 wherein the secondly indicating step is accomplished with light emitting diodes.

104. The method of claim 72 further comprising the step of detecting whether a telephone line used by the calling step is off-hook.

105. The method of claim 104 wherein the off-hook detecting step comprises the steps of:

(a) generating one of a positive and negative voltage change using a plurality of diodes, whereby a positive voltage change represents that the telephone line is on-hook and a negative voltage change represents that the telephone line is off-hook;

(b) detecting the voltage change with a plurality of discrete circuits;

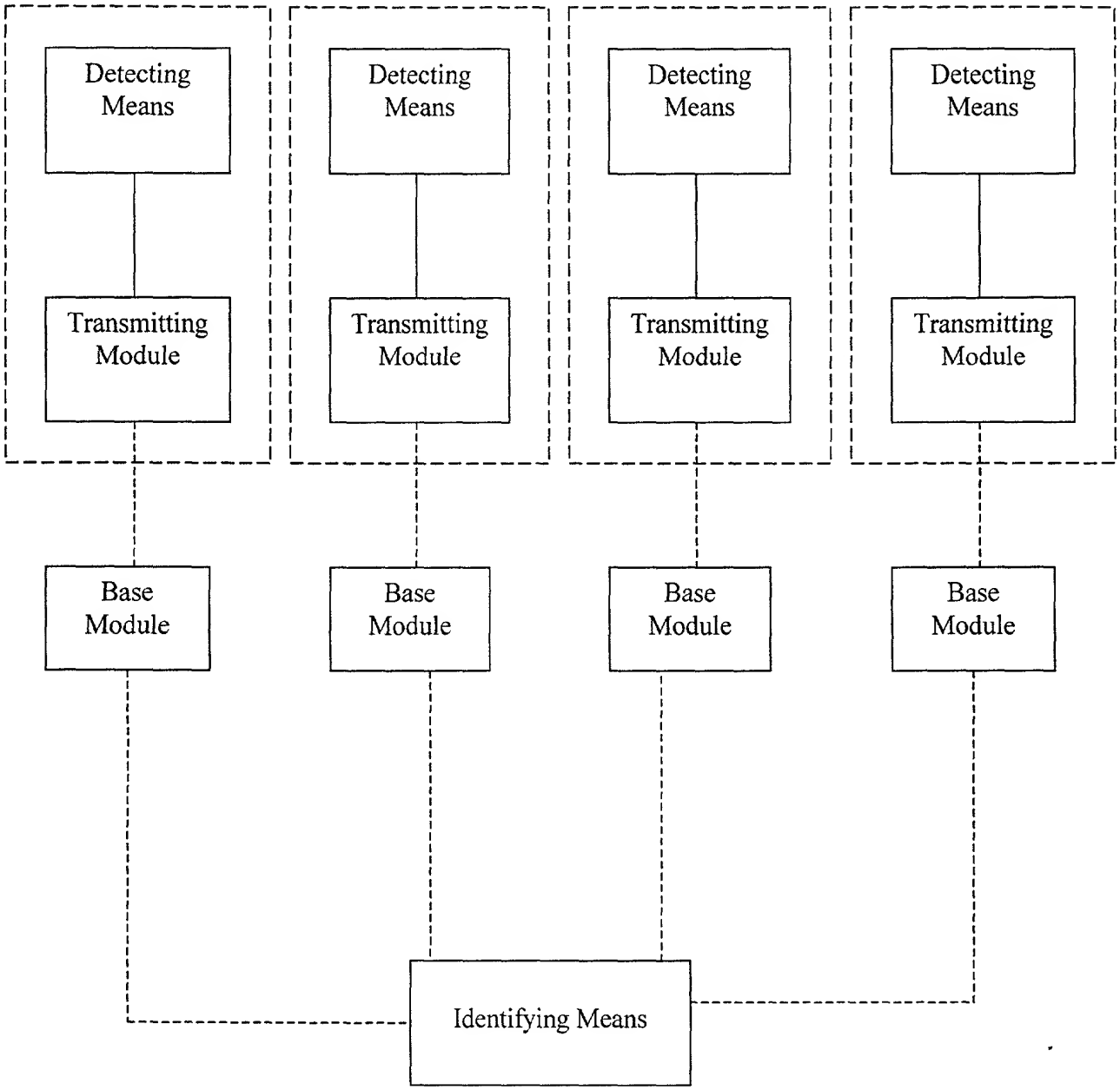
(c) indicating the voltage change with a light emitting diode, whereby a lit light emitting diode indicates a negative voltage change and a dim light emitting diode indicates a positive voltage change; and

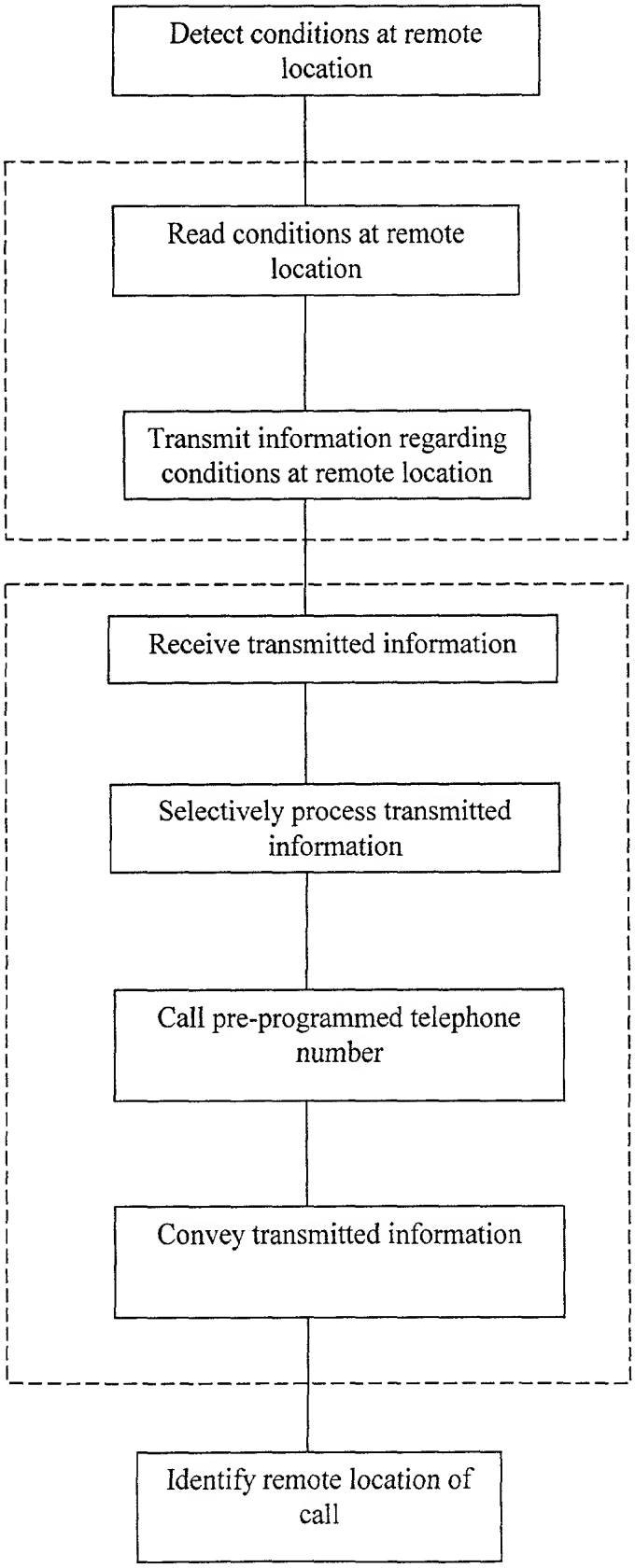
(d) relaying the voltage change to the first processing step.

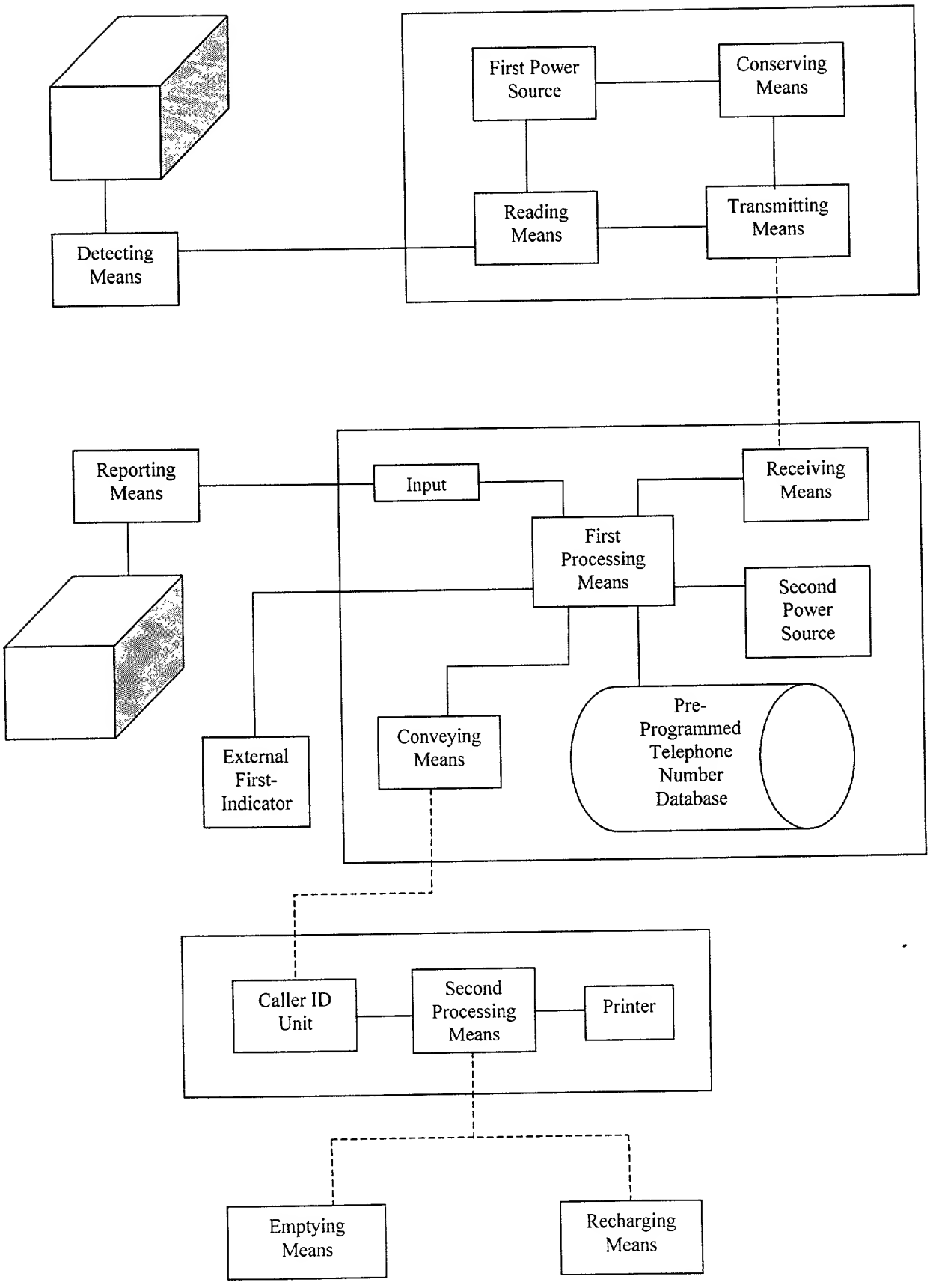
106. The method of claim 72 further comprising the step of disconnecting the call to the pre-programmed telephone number after a predetermined number rings, whereby the the disconnecting step prevents the call from incurring a telephone toll charge.

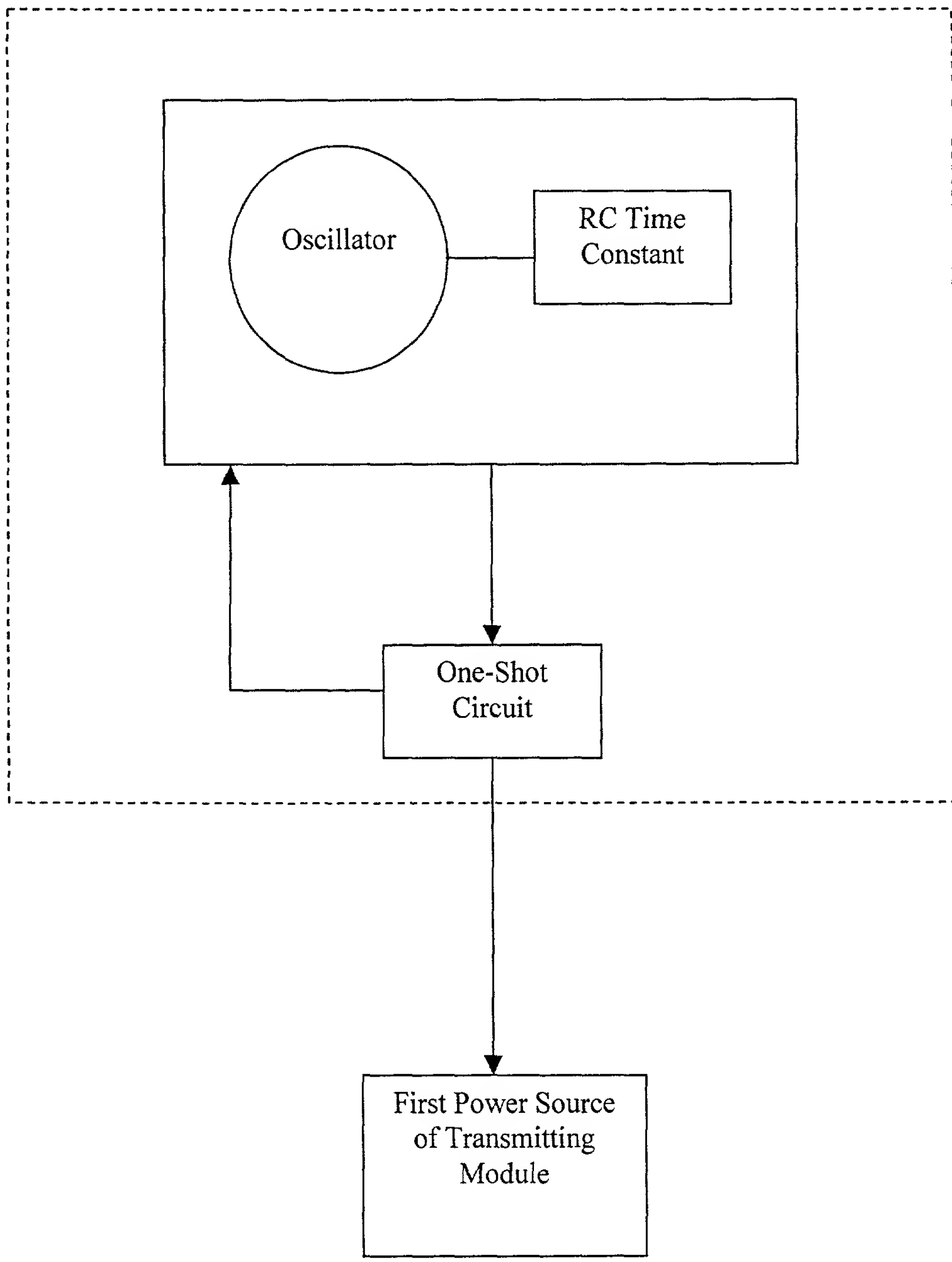
ABSTRACT OF THE DISCLOSURE

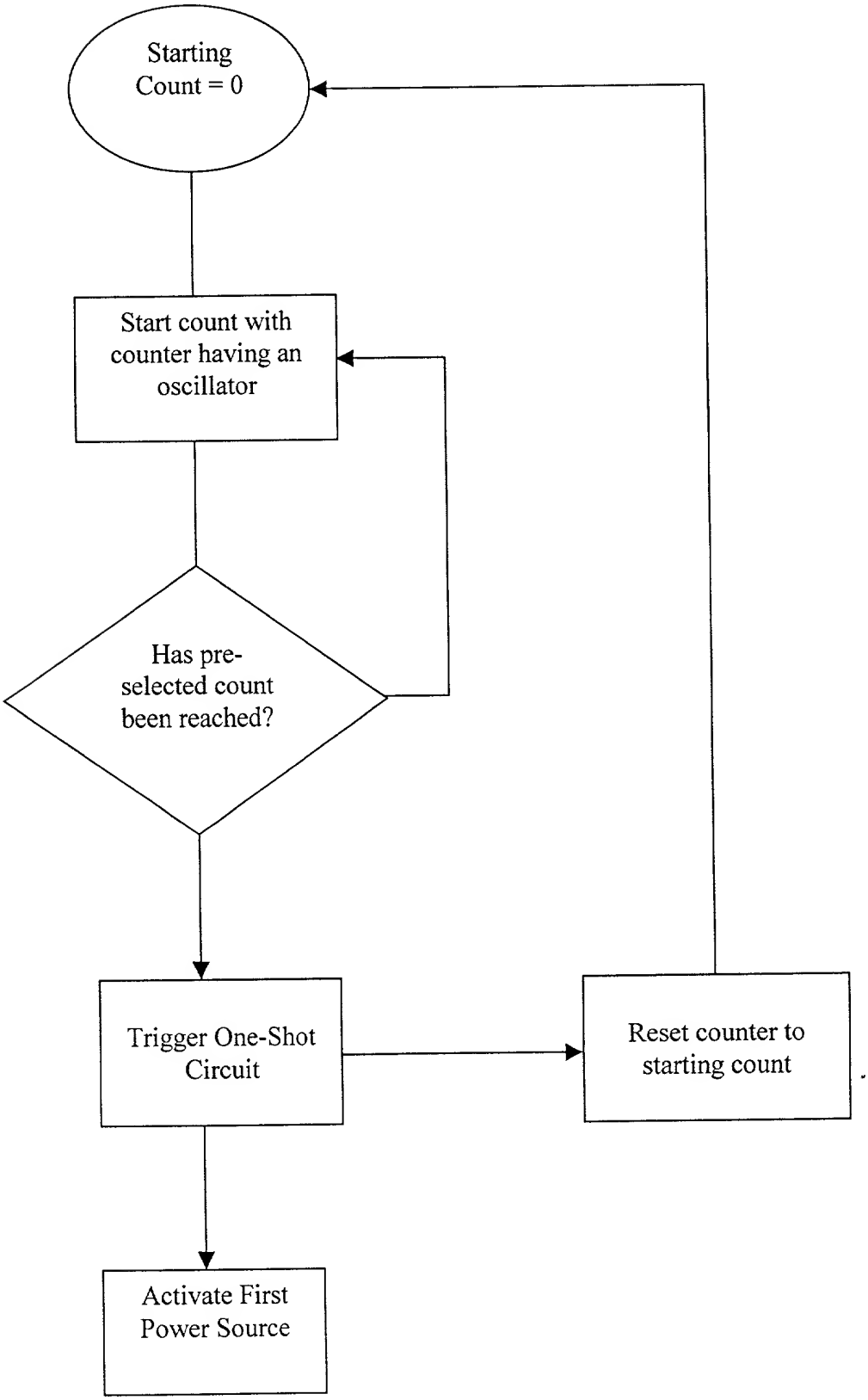
The present invention is for a sensing device that monitors the conditions of a remote location. The device has a detecting means which detects the conditions at the remote location; a transmitting module that reads and remotely transmits information containing the detected conditions and the power level of a power source powering the transmitting module; a base module that receives, selectively processes and conveys the information telephonically; and an identifying means that identifies the remote location of the call without incurring a telephone toll charge. The invention is also directed to a method of sensing conditions at a remote location without incurring telephone toll charges.

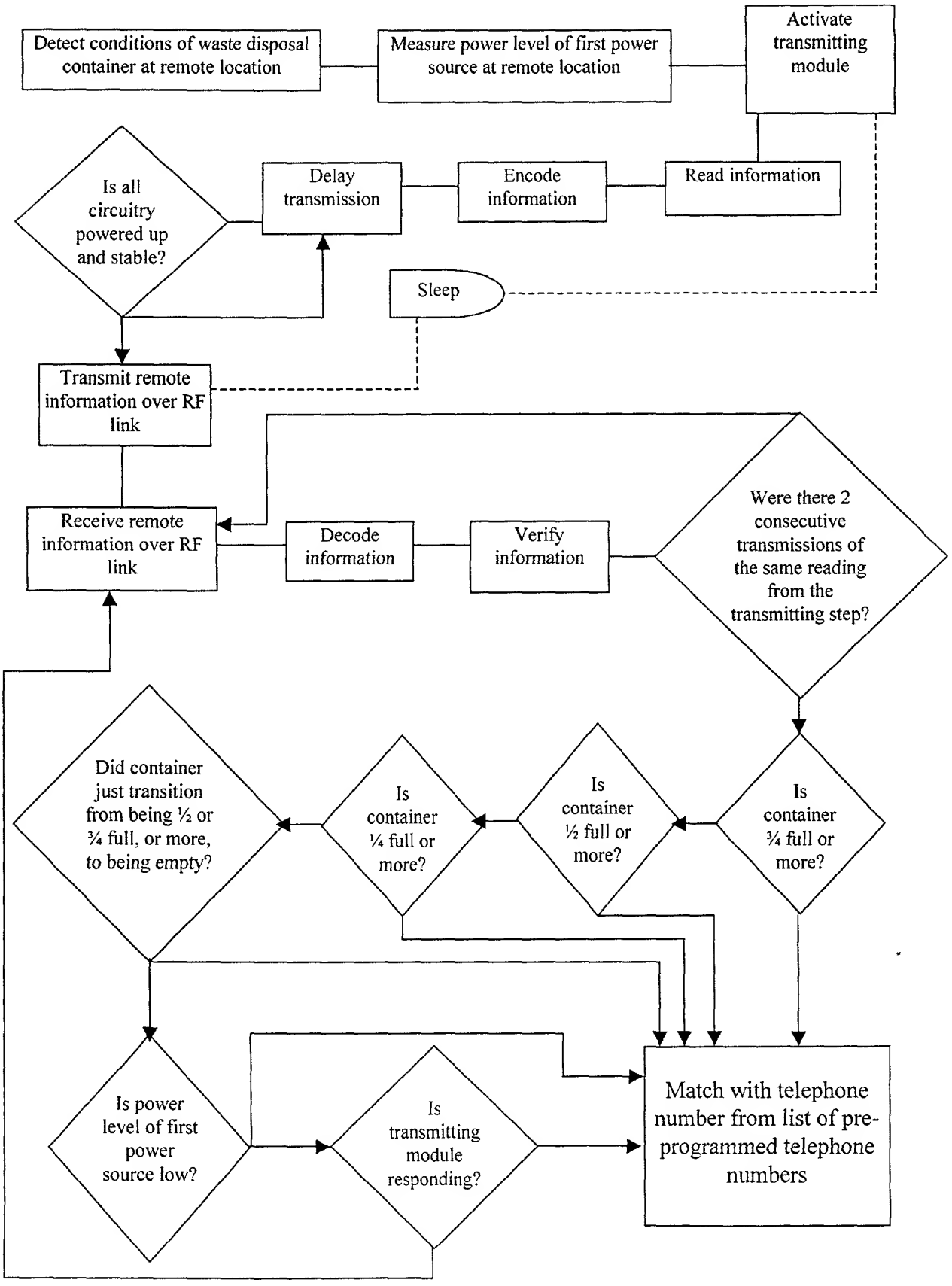

Detecting Means
Detecting Means
Detecting Means
Detecting Means
Transmitting Module
Transmitting Module
Transmitting Module
Transmitting Module
Base Module
Base Module
Base Module
Base Module
Identifying Means

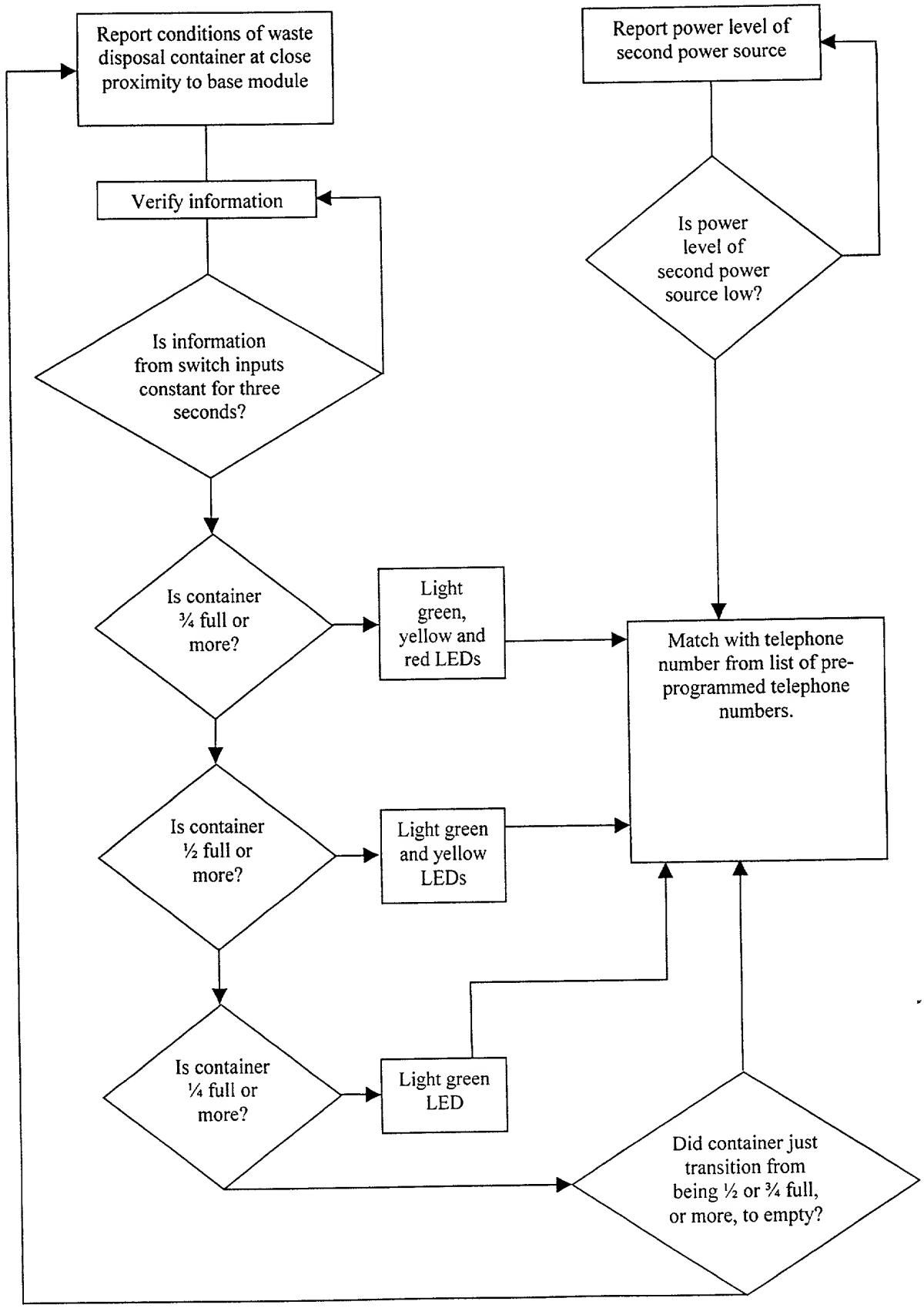

Detect conditions at remote location
Read conditions at remote location
Transmit information regarding conditions at remote location
Receive transmitted information
Selectively process transmitted information
Call pre-programmed telephone number
Convey transmitted information
Identify remote location of call

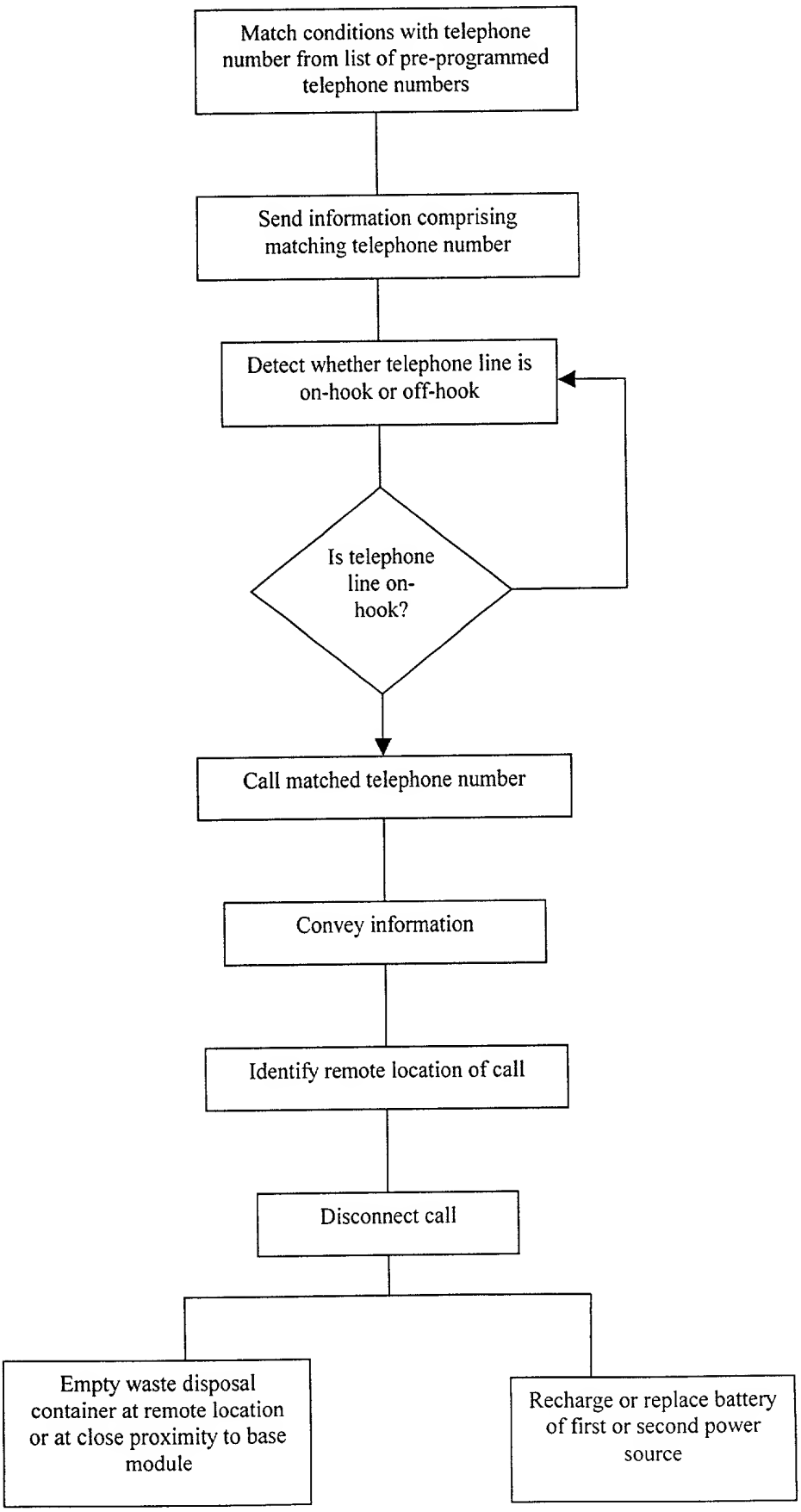

First Power Source
Conserving Means
Reading Means
Transmitting Means
Detecting Means
Reporting Means
Input
Receiving Means
First Processing Means
Second Power Source
External First-Indicator
Conveying Means
Pre-Programmed Telephone Number Database
Caller ID Unit
Second Processing Means
Printer
Emptying Means
Recharging Means

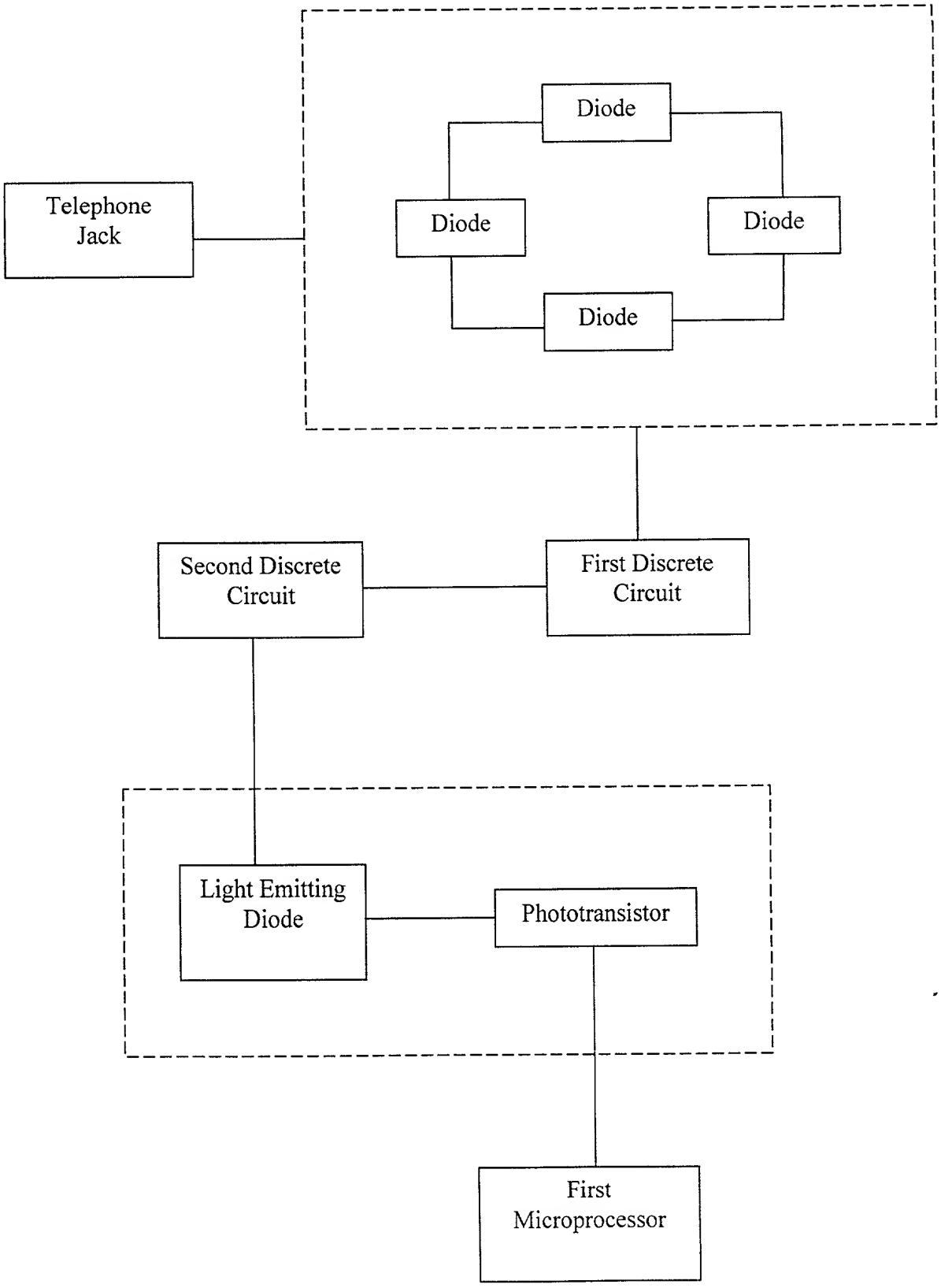

Oscillator
RC Time Constant
One-Shot Circuit
First Power Source of Transmitting Module


Starting
Count = 0
Start count with
counter having an
oscillator
Has pre-
selected count
been reached?
Trigger One-Shot
Circuit
Reset counter to
starting count
Activate First
Power Source


Detect conditions of waste disposal container at remote location
Measure power level of first power source at remote location
Activate transmitting module
Is all circuitry powered up and stable?
Delay transmission
Encode information
Read information
Sleep
Transmit remote information over RF link
Receive remote information over RF link
Decode information
Verify information
Were there 2 consecutive transmissions of the same reading from the transmitting step?
Did container just transition from being ½ or ¾ full, or more, to being empty?
Is container ¼ full or more?
Is container ½ full or more?
Is container ¾ full or more?
Is power level of first power source low?
Is transmitting module responding?
Match with telephone number from list of pre-programmed telephone numbers


Report conditions of waste disposal container at close proximity to base module
Verify information
Is information from switch inputs constant for three seconds?
Is container ¾ full or more?
Light green, yellow and red LEDs
Is container ½ full or more?
Light green and yellow LEDs
Is container ¼ full or more?
Light green LED
Report power level of second power source
Is power level of second power source low?
Match with telephone number from list of pre-programmed telephone numbers.
Did container just transition from being ½ or ¾ full, or more, to empty?


Match conditions with telephone number from list of pre-programmed telephone numbers
Send information comprising matching telephone number
Detect whether telephone line is on-hook or off-hook
Is telephone line on-hook?
Call matched telephone number
Convey information
Identify remote location of call
Disconnect call
Empty waste disposal container at remote location or at close proximity to base module
Recharge or replace battery of first or second power source


Diode
Telephone Jack
Diode
Diode
Diode
Second Discrete Circuit
First Discrete Circuit
Light Emitting Diode
Phototransistor
First Microprocessor

U.S. Department of Commerce
Patent and Trademark Office

Attorney Docket Number:
First Named Inventor: J.J. Richardson
COMPLETE IF KNOWN
Application Number:
Filing Date:
Group Art Unit:
Examiner Name:

DECLARATION FOR UTILITY OR DESIGN PATENT APPLICATION

[X] Declaration Submitted w/ Initial Filing OR [ ] Declaration Submitted after Initial Filing

As a below named inventor, I hereby declare that:

My residence, post office address and citizenship are stated below next to my name.

I believe I am the original, first and sole (if only one name is listed below) or an original, first and joint inventor (if plural names are listed below) of the subject matter which is claimed and for which a patent is sought on the invention entitled:

Sensing Device for Monitoring Conditions at a Remote Location and Method Therefor

the specification of which
[X] is attached hereto
OR
[ ] was filed on (MM/DD/YYYY) ______ as United States Application Number or PCT International Application Number _____________ and was amended on (MM/DD/YYYY)_______ (if applicable).

I hereby state that I have reviewed and understand the contents of the above identified specification, including the claims, as amended by any amendment referred to above.

I acknowledge the duty to disclose information which is material to patentability as defined in Title 37, Code of Federal Regulations, § 1.56.

I hereby claim foreign priority benefits under Title 35, United States Code § 1.19 of any foreign application(s) for patent or inventor's certificate listed below and have also identified below any for application for patent or inventor's certificate having a filing date before that of the application on which priority is claimed:

Prior Foreign Application Number(s)	Country	Foreign Filing Date (MM/DD/YYYY)	Priority Not Claimed	Certified Copy Attached? Yes [ ] No [ ]

[ ] Additional foreign application numbers are listed on supplemental priority sheet attached hereto:

I hereby claim the benefit under Title 35, United States Code, § 119(e) of any United States provisional application(s) listed below

Application Number(s)	Filing Date (MM/DD/YYYY)
60/113466	12/23/1998

[ ] Additional provisional application numbers are listed on a supplemental priority sheet attached hereto.

DECLARATION

I hereby claim the benefit under Title 35, United States Code, § 120 of any United States application(s), or ° 365(c) of any PCT international application designating the United States of America, listed below and, insofar as the subject matter of each of the claims of this application is not disclosed in the prior United States or PCT International application in the manner provided by the first paragraph of Title 35, United States Code, § 112, I acknowledge the duty to disclose information which is material to patentability as defined in Title 37, Code of Federal Regulations, § 1.56 which became available between the filing date of the prior application and the national or PCT international filing date of this application.

U.S. Parent Application Number	PCT Parent Number	Parent Filing Date (MM/DD/YYYY)	Parent Patent Number *(if applicable)*

[ ] Additional U.S. or PCT International application numbers are listed on a supplemental priority sheet attached hereto.

As named inventor, I hereby appoint the following attorney(s) and/or agent(s) to prosecute this application and to transact all business in the Patent and Trademark Office connected therewith:

Mark E. Wiemelt Registration #: 36,055

Please direct all correspondence to:

Mark E. Wiemelt
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Chicago, IL 60603

312/372-7664 Fax: 312/372-6568

I hereby declare that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true; and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under Section 1001 of Title 18 of the United States Code and that such willful false statements may jeopardize the validity of the application or any patent issued therefrom.

Name of sole or first inventor: [ ] A petition has been filed for this unsigned inventor
Given Name: J. Middle Initial: J. Family Name: Richardson Suffix (e.g. Jr.):

Inventor's Signature: X _____ Dated: X 10-25-99
Residence: City: Jacksonville State: IL Country: USA Citizenship: USA
Post Office Address: X 2306 Magnolia Drive
City: Jacksonville State: IL Zip: X 62650 Country: USA Applicant authority:

[X] Additional inventors are being named on supplemental sheet(s) attached hereto.

DECLARATION

ADDITIONAL INVENTOR(S)
Supplemental Sheet

Name of Additional Joint Inventor, if any: [ ] A petition has been filed for this unsigned inventor

Name of sole or first inventor: [ ] A petition has been filed for this unsigned inventor
Given Name: Steve Middle Initial: Family Name: Stone Suffix (e.g. Jr.):

Inventor's Signature: X Steve Stone Dated: X 10-28-1999
Residence: City: Virden State: IL Country: USA Citizenship: USA
Post Office Address: X 202 MALTBY ROW
City: Virden State: IL Zip: X 62690 Country: USA Applicant authority:

DECLARATION

ADDITIONAL INVENTOR(S)
Supplemental Sheet

Name of Additional Joint Inventor, if any: [ ] A petition has been filed for this unsigned inventor

Name of sole or first inventor: [ ] A petition has been filed for this unsigned inventor
Given Name: Donald. Middle Initial: Family Name: Onken Suffix (e.g. Jr.):

Inventor's Signature: X Donald Onken Dated: X 10-29-99
Residence: City: Easton State: IL Country: USA Citizenship: USA
Post Office Address: X BOX-42
City: Virden State: IL Zip: X 62633 Country: USA Applicant authority:

EXPLANATION OF ACKNOWLEDGEMENT

The acknowledgement of your duty to disclose information which is material to the examination of the application in accordance with Title 37, Code of Federal Regulations, § 1.56(a) required in the Declaration is a shorthand way of your acknowledging:

> that as to the subject matter of the present application, you do not know and do not believe that it was ever known or used in the United States of America before your invention thereof or patented or described in any printed publication in any country before your invention thereof or more than one year prior to the date of the present application, or in public use or on sale in the United States of America more than one year prior to the date of the present application;
>
> that said subject matter has not been patented or made the subject of an inventor's certificate issued in any country foreign to the U.S. on an application filed by you or your legal representatives or assigns more than twelve months prior to the date of the present invention;
>
> that no application for patent or inventor's certificate on said subject matter has been filed by you or your representatives or assigns in any country foreign to the United States of America, except those identified, if any; and
>
> that you will advise us of the closest prior art of which you are aware so that we may bring it to the attention of the Patent and Trademark Office.